OUTCOME AND PROCESS EVALUATION OF THE BUILD-A-BONE OSTEOPOROSIS PREVENTION PROGRAM

by

Robyn Marie Hyatt

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STATEMENT OF DISSERTATION APPROVAL

The dissertation of **Marie**

has been approved by the following supervisory committee members:

Karol L. Kum	, Chair	**March 9, 2010**
F.	, Member	**March 9, 2010**
Michael Caserta	, Member	**March 9, 2010**
Paul A. Gore	, Member	**March 9, 2010** Date
Trela	, Member	**March 9, 2010**

and by **Glenn E. Richardson**, Chair of

the Department of **Health Promotion and Education**

and by Charles A. Wight, Dean of The Graduate School.

ABSTRACT

Osteoporosis is a commonly occurring bone disease that impacts more than half of the U.S. population over age 50, with women a large majority of the affected population. Debilitating complications include fractures, pain, and a decrease in quality of life. Early recognition, particularly in perimenopausal years, can significantly decrease morbidity and related health-care costs of osteoporosis.

The Build-A-Bone Osteoporosis Prevention Program offers an innovative and unique approach to osteoporosis prevention with a multicomponent experiential skills training program. Whereas the program had never been evaluated since inception, this study was designed to investigate the effectiveness (i.e., behavior change), impact (i.e., fall reduction), and client satisfaction of 83 past participants using retrospective pretest/posttest questionnaires.

The research design was a 2 (repeated measures) X 2 (post hoc risk level) analysis of variance. Research questions addressed both main effects for program outcomes (i.e., time) and interactions between time and risk and examined dependent variables of modifiable risk factors, physical activity, balance, nutrition and dietary patterns, personal health beliefs, and falls. Outcomes were measured using subscale portions of standardized instruments.

Conclusions of this study are positive and suggest that a multicomponent experiential skills training program for osteoporosis prevention can reduce risk factors

and falls. Participants reported that their rate of falls had decreased by 50% from prior to the program and significantly increased physical activity. The participants' composite modifiable risk factors decreased significantly. Significant main effects for both time and risk factors were found in nutrition and dietary patterns. Significant main effects for time were found for subscales of the Osteoporosis Health Belief Scale. Dosage and client satisfaction were not related to any examined posttest outcomes, and time since program completion showed no significant main effects or interactions. Process evaluation results indicated high client satisfaction and significant correlations with requests for refresher courses and positive comments of the program's contribution to health.

Certain aspects of osteoporosis prevention were not addressed, including ways to recruit individuals at risk in underserved populations and exploration of the impact of osteoporosis prevention programs on increased bone density based on actual laboratory data. Further research is needed to investigate these factors and advance osteoporosis prevention.

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CHAPTER 1

INTRODUCTION

Osteoporosis is the most commonly occurring bone disease that affects approximately 55% of the U.S. population over 50 years old, with 80% of affected individuals being women (National Osteoporosis Foundation, 2008). The National Osteoporosis Foundation estimates that in the United States 10 million Americans already have osteoporosis and another 34 million have low bone mass (osteopenia) that puts them at risk for osteoporosis. Osteoporosis is referred to as a "silent" disease that can remain undetected until fractures or falls occur unless a dual-energy x-ray absorptiometry scan is conducted based on family history or risk factors. Osteoporosis is characterized by bone loss, low bone mass, and microarchitecture deterioration, particularly of trabecular bone tissue leading to bone fragility and increased risk of fractures. Experts estimate that approximately one in four men and one in two women over the age of 50 will experience an osteoporosis-related fracture in their lifetime (National Osteoporosis Foundation).

Complications related to osteoporosis include pain, loss of mobility, loss of independence, decrease in quality of life, interference with activities of daily living, and interference with familial relationships (Meadows & Mrkonjic, 2003; Roberto, 2004). Fear of health changes, depression, and anxiety are often reported in women with osteoporosis (Lydick, Martin, & Yawn, 1996; Silverman, Shen, Minshall, Xie,

& Moses, 2007).

Osteoporosis is preventable and treatable. Health promotion and education interventions are valuable to disease prevention and management with the potential to increase knowledge and change behaviors. Unfortunately, few osteoporosis prevention programs have been studied that give insight on effective ways to provide knowledge and change behaviors in order to help reverse the trajectory of this disease.

Problem Statement

According to a search of the research literature and conversations with the Build-A-Bone Osteoporosis Prevention Program (hereafter referred to as Build-A-Bone Program) program director, few osteoporosis prevention programs are in the United States (P. Trela, personal communication, March 4, 2009). Current prevention programs utilize formats such as education only (Blalock et al., 2000; Magee, Stuberg, & Schmutte, 2008; Sedlak, Doheny, & Jones, 2000) or education combined with focus on specific osteoporosis risk factors such strength training (Cussler et al., 2005), balance (Sinaki & Lynn, 2002), and nutrition or physical activity (Wilcox et al., 2009). Other prevention programs utilize a multidisciplinary medical team approach (Blalock et al., 2002; Cerulli & Zoella, 2004; Foldi, Belgeri, Perry, & Gaebelein, 2005; Jamal et al., 1999; Kulp, Rane, & Bachmann, 2004; MacLaughlin et al., 2005; Rolnick, Kopher, Jackson, Fischer, & Compo, 2001; Sedlak, Doheny, Estok, & Zeller, 2005). However, few osteoporosis prevention programs could be located that target multiple prevention components with experiential educational sessions as presented in the Build-A-Bone Program.

In addition, there is little outcome and process evaluation research to establish the evidence base for effectiveness and impact of brief community outreach osteoporosis prevention interventions. Despite having between 200 and 250 prior participants since its inception in 2005, the Build-A-Bone Program has never been evaluated for effectiveness on behavior change, reduction in falls, or client satisfaction. This investigation advances osteoporosis prevention, contributes to the research literature on osteoporosis prevention programs, provides an important contribution for program improvements, looks at future research funding, and disseminates results to other programs and clinics.

Purpose of the Research Study

The purpose of this study was to develop new knowledge relating to osteoporosis prevention by conducting evaluation research on the Build-A-Bone Program's effectiveness in reducing falls and improving quality of life of individuals with or at risk for osteoporosis. This study was designed to investigate the effectiveness, impact, and client satisfaction of the Build-A-Bone Program at the University of Utah Orthopedic Center in Salt Lake City, Utah. Effectiveness was measured as behavior change in risk reduction, and impact was measured by fall reduction.

Overall program effectiveness and impact of the Build-A-Bone Program in reducing falls and improving quality of life were investigated with an outcome evaluation. Further, a process evaluation investigating program implementation variables such as retention rates, client satisfaction, and suggestions for improvements

in the Build-A-Bone Program was conducted. Chapter 3 reports the outcome research results and Chapter 4 reports the process evaluation results.

Summary of Chapters

This dissertation follows a three-article format according to the graduate specifications of the Department of Health Promotion and Education and The Graduate School at the University of Utah with the following content in each of the five chapters:

Chapter 1 consists of an introduction and overview of the need for this dissertation and research study, including a summary of the five chapters and definitions of terms. Further, this chapter includes research hypotheses, research questions, and study limitations.

Chapter 2 is a proposed journal article that describes the significance of the research study, including background and rationale. A comprehensive literature review incorporating information with regard to incidence and prevalence of osteoporosis in both general and specific populations as well as risk factors and associated lifestyle modifications necessary for disease prevention and management is provided. The background justification for this research is offered, including information about different types of osteoporosis prevention interventions with research on their outcomes. A discussion of effectiveness and impact of multifactor experiential skills training interventions is provided and is followed by an in-depth description of the Build-A-Bone Program. Behavior change over time is discussed and a theoretical framework guiding osteoporosis prevention programs is presented with

discussion of outcome and process evaluation research relevant to osteoporosis prevention programs. The discussion summarizes the literature review by presenting the importance for the research.

Chapter 3 is a proposed journal article providing a brief description of the background and significance of the research and presents the main results of this study entitled "Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program." This chapter outlines the specific research aims, research questions, and hypotheses addressed with this investigation. The research methodology is presented, including study procedures, results, study limitations, discussion, and conclusions of the study.

Chapter 4 is a proposed journal article discussing the process evaluation results, which was another specific aim of this study. Background and rationale for a process evaluation of the Build-A-Bone Program is presented. Attention is given to the specific types of clients enrolled in the Build-A-Bone Program, individuals responsible for referrals to the program, personal knowledge/relationships with program staff, attendance, and client satisfaction with interest in refresher classes. Individual perceptions of improvement to overall health are addressed along with participant recommendations for improvement in the Build-A-Bone Program. Process evaluation procedures are outlined, including research methodology, measurement and data analysis, and discussion and conclusions of the study.

Chapter 5 contains a review of the study, a summary of the results of the study with study limitations, and an in-depth discussion/conclusions.

Recommendations for practice improvements, research improvements, and future research are provided.

Definitions of Terms

The following key terms and definitions are relevant to the understanding of concepts in this study (National Osteoporosis Foundation, 2008):

Bone mineral density is a medical term referring to the mineral matter per cubic centimeter of bone. Bone mineral density is measured by densitometry in the diagnosis of osteopenia and osteoporosis.

Calcium is an essential mineral that helps build and maintain strong bones and teeth. Calcium is stored in the bones and regulates muscle contractions and heartbeat. Adequate calcium is necessary to prevent or minimize osteoporosis. Sources of calcium include dairy products, broccoli, spinach, oranges, beans and peas, salmon, and supplements.

Dual-energy x-ray absorptiometry is a test used for the detection of osteopenia and osteoporosis. Dual-energy x-ray absorptiometry is a preferred method for diagnosis and can be performed on the hip, spine, forearm, heel or total body.

Osteoporosis is a bone disease characterized by the reduction in bone mass and bone density resulting in fragile, porous bones with predisposition to fractures and bone deformities. Osteoporosis is due to depletion of bone protein and calcium.

Osteopenia is a decrease in bone density or decrease in calcification that is generally caused by a reduction in the rate of the formation of new bone that is insufficient to maintain with the rate of bone destruction. Osteopenia may lead to

osteoporosis if left untreated.

Resistance exercises use muscular strength to strengthen and support bone and improve muscle mass. Resistance exercises utilize free weights, weighted vests, wrist/leg weights, and resistance machines.

T score reflects standard deviations and indicates how much bone density is above or below normal. *T* score is used to diagnose osteoporosis when comparing bone density to a healthy 30-year-old adult with peak bone density. A *T* score between +1 and -1 is considered normal bone density, and a *T* score between -1 and -2.5 signifies osteopenia or low bone density. A *T* score of -2.5 or lower is considered osteoporosis (World Health Organization, 2003). In general, 1 standard deviation difference in a *T* score equates to a 10% to 15% decrease in bone density.

Vitamin D is a steroid vitamin and a group of five known fat-soluble prohormones. Vitamin D encourages the metabolism and absorption of calcium. Sunlight exposure promotes synthesis of vitamin D production in the skin. Additional sources of vitamin D include fish liver oils, beef liver, fatty fish, and supplements.

Weight-bearing exercises is a type of exercise in which bones of the legs bear the weight of the body such as jogging or walking. Weight-bearing exercises are important for building and keeping bone strength and integrity.

Research Aims

Specific Aim 1

Specific Aim 1 is to conduct a 2.5-year retrospective analysis of the long- term effectiveness and impact of the Build-A-Bone Program by conducting survey research

and comparing self-reported clinical record outcomes of approximately 100 clients. Outcomes include the following: (a) behavior change with regard to physical activity (i.e., walking, balance, weight lifting, and core strength) and nutrition and dietary patterns (i.e., calcium intake, vitamin D intake, caffeine and alcohol consumption, and sodium, protein, and wheat bran intake); (b) reduction in the number of modifiable risk factors; and (c) reduction in falls.

Specific Aim 2

Specific Aim 2 is to conduct a process evaluation of the implementation of the Build-A-Bone Program by collecting survey data on participant demographic information, attendance, client satisfaction, and ideas for program improvement.

Research Questions and Hypotheses

Specific Aim 1: Subgroup Main Effect
Research Questions

Research Question 1. Do program participants improve their positive risk reduction behaviors after program participation from pretest to posttest?

1. Hypothesis 1: Program participants will improve their positive risk reduction behavior after program participation.
2. Null Hypothesis 1: Program participants will not improve their positive risk reduction behavior after program participation.

Design: A one-group pretest/posttest design. The measurement indicator is scores on the osteoporosis risk assessment:

Group 1: O X.

Research Question 2. Does the program participant's history of falls improve from pretest to posttest?

1. Hypothesis 2: The program participant's history of falls improves from pretest to posttest.
2. Null Hypothesis 2: The program participant's history of falls will not improve from pretest to posttest.

Design: A one-group pretest/posttest design. The measurement indicator is scores on the falls assessment:

Group 1: O X.

Research Question 3. Does the client risk level at program entry measured by the osteoporosis risk assessment result in larger positive outcomes as measured by impact on falls, increased physical activity, and improved nutrition?

1. Hypothesis 3: Clients with the greatest number of risk factors at program entry will improve more than those with fewer risk factors.
2. Null Hypothesis 3: Clients with the greatest number of risk factors at program entry will not improve more than those with fewer risk factors.

Design. A retrospective cohort study was used with a 2 group X 2 pretest/posttest measure, post hoc, quasi-experimental subgroup analysis comparing participants with high-risk levels at the Build-A-Bone Program entry with those with

lower risk levels. The measurement indicator for risk level is scores on the osteoporosis risk assessment:

High-risk participants: O X O

and

Low-risk participants: O X O.

Research Question 4. Does dosage (i.e., attendance) affect measured osteoporosis health outcomes (i.e., reduction in risk factors and falls and improvement in physical activity, balance, nutrition and dietary patterns, and personal health beliefs)?

1. Hypothesis 4: Clients with greater program dosage (i.e., attendance) will have greater reduction in risk factors for osteoporosis, improved behavioral (i.e., physical activity and nutrition), and physical outcomes (i.e., fall reduction) over time.
2. Null Hypotheses 4: Clients with greater program attendance or greater program satisfaction will not have statistically significant reduction in risk factors for osteoporosis nor improvement in behavioral (i.e., physical activity and nutrition) and physical outcomes (i.e., fall reduction) over time.

Design. A retrospective cohort study was used with a 2 group X 2 pretest/posttest measure, post hoc, quasi-experimental subgroup analysis comparing

participants with higher dosage (i.e., attendance) levels at the Build-A-Bone Program entry with those with lower dosage levels. The measurement indicator for dosage level is scores on reported attendance:

High-dosage participants: O X O

and

Lower-dosage participants: O X O.

Research Question 5. Do program participants who have been out of the program longer have better or worse outcomes than those who completed the program more recently? Hence, this question addresses whether the program has long-term impact and benefit for clients or whether the results degrade with time since the program.

1. Hypothesis 5: Clients who completed the program earlier (i.e., in terms of month of enrollment) will have greater reduction in risk factors for osteoporosis, improved behavioral (i.e., physical activity and nutrition), and physical outcomes (i.e., fall reduction) over time.
2. Null Hypotheses 5: Clients who completed the program earlier will not have greater reduction in risk factors for osteoporosis nor improvement in behavioral (i.e., physical activity and nutrition) and physical outcomes (i.e., fall reduction) over time.

Design. A retrospective cohort study was used with a 2 group X 2 pretest/posttest measure, post hoc, quasi-experimental subgroup analysis comparing participants who completed the Build-A-Bone Program earlier in time with those who completed more recently. The measurement indicator is time of enrollment:

Earlier participants: O X O

and

Later participants: O X O.

Specific Aim 2: Process Evaluation Research Questions

1. What was the average attendance in the program?
2. What are the characteristics of the participants who attended the program?
3. What was the overall level of client satisfaction with the program?
4. What are correlates (e.g., client or program characteristics) of high client satisfaction?
5. What are client recommendations for program improvement?

Study Limitations

The limitations with the research methods and design utilized in this study are listed below. Many of these study limitations could not be addressed given the practicalities of conducting this research within the time constraints and using a retrospective compared with a prospective study design.

Experimental Design Limitations in Internal Validity

The foremost limitation of this study is the lack of a true experimental randomized control design that controls for all threats to internal validity of the results. Other researchers have noted similar limitations with the inability to determine actual effectiveness and impact of a program without a randomized control group (Davis, White, & Yang, 2006; Pearson, Burkhart, Pifalo, Pallago-Toy, & Krohn, 2005).

The actual design for this study was a postonly nonexperimental design because the participants were enrolled and surveyed with a retrospective prequestionnaire/postquestionnaire after they participated in the Build-A-Bone Program. This design allowed the participants to rate themselves twice at the same setting, and I was able to measure behavior changes, falls, and health beliefs by using a retrospective pretest/posttest by asking the participants to recall behaviors, falls, and health beliefs *before* taking the Build-A-Bone Program compared with *current* behaviors, falls, and health beliefs or *after* taking the program.

In order to improve on the design flaws, I turned the nonexperimental design into a quasi-experimental, post hoc statistical design by proposing research questions of the impact of the program on different types of clients. In this way, I compared the program outcomes for a group of clients at high risk with those at low risk for osteoporosis and outcomes for clients with high client satisfaction with those with low client satisfaction. In addition, I planned a dosage analysis to compare the outcomes for clients who attended all of the sessions with those who did not attend all sessions.

The rigor of a research study is the ability to measure what actually happened during the study and is directly influenced by internal validity (Valente, 2002). Limitations of internal validity are directly related to the use of a quasi-experimental correlational ex post facto design, sometimes called a post hoc statistical design in that it does not control for selection bias (since participants were different on risk level), statistical regression to the mean (high risk will likely improve more naturally), and possibly selection maturation (differential rates of change in the groups).

The controlled threats to internal validity are greatly improved by this quasi-experiment design and analysis. Threats, including history, maturation, testing, instrumentation, placebo, diffusion, Hawthorne effect, location, and implementation, are now controlled. The nonexperimental preonly/postonly design controls for selection and mortality threats to internal validity of the outcome results only. Each of these threats to the internal validity of the study results is discussed below (Campbell & Stanley, 1963).

History. Since the participants in both groups participated in the Build-A-Bone Program during the same period of time, the impact of differential historical impact on the outcomes is controlled for in the quasi-experimental design but not in the nonexperimental design. The passage of time with important historical events that affect most people equally may influence outcomes of the study and lead to inaccurate results (Creswell, 2002). Study participants may have made improvements in osteoporosis prevention behaviors because of these historical events (e.g.,

communitywide media campaigns stressing increased physical activity and improved calcium intake or knowledge about risks for osteoporosis, natural disasters that reduce a population's mobility and activity, and news events about a movie star who has osteoporosis) and not specifically related to participation in the Build-A-Bone Program.

Maturation. Since participants were studied over the same amount of time in both groups, this natural change in reductions in bone density with aging was controlled for in the quasi-experimental design but not in the nonexperimental main effects design.

Testing. This threat to internal validity of a testing effect was controlled for by the retrospective pretest/posttest data collection method because there was no sensitization to the test questions since there was no pretest prior to the program.

Instrumentation. This threat was controlled for because both groups received the same "then-and-now" prequestionnaire/postquestionnaire. I also selected well-used instruments with high alpha reliability and validity to match the outcome variables so as to maximize content or construct validity. In any case, the quasi-experimental design assured that both groups share equivalent bias from instrumentation since all participants received the same test instrument.

Placebo. This threat involved improvement due to real or perceived expectation rather than the treatment or intervention, and it can occur when the participants receive a treatment they believe likely to be beneficial. This threat was controlled for because all participants received the same treatment and were tested

during the same time period.

Diffusion of treatment. This threat was when one group became aware of information or an intervention and influences practices meant for another group. This threat was controlled for with the use of one group of participants in the study and not two groups.

Hawthorne effect. This threat was the effect of being studied upon the participants may cause them to act or respond differently. This threat was controlled for with the use of the retrospective pretest/posttest design.

Location. The impact on the threat of location was controlled for because all participants received the questionnaires under the same conditions, as they were either mailed or e-mailed to the participants.

Implementation. This threat is the potential effect of differing methods of intervention implementation. This threat was controlled for because the same participants were studied in the same time period.

Selection bias. This threat was not controlled for because all participants in this study were at different risk levels exhibiting important differences such as number of risk factors, amount/type of physical activity, and health beliefs.

Selection maturation effect. This threat comes with differential rates of normal growth between pretests/posttests for different groups. This threat was not controlled for with the quasi-experimental design.

Statistical regression to the mean. This threat was not controlled for because participants with high risk for osteoporosis may likely improve naturally and scores

from these individuals will naturally regress more towards the mean.

Threats to External Validity or Generalization Threats

Selection/treatment interaction. The results can probably be generalized to other groups of similar participants only but not to a different study population that is ethnically or educationally vastly different. The participants in the Build-A-Bone Program included in this study were primarily educated, postmenopausal Caucasian women between the ages of 50 and 80 who displayed self-motivation for behavior/lifestyle change and who voluntarily participated in the program. Other studies have reported investigations of similar populations (Francis, Matthews, Van Meechelen, Bennell, & Osborne, 2009; Jamal et al., 1999; Pearson et al., 2005). Because of the highly motivated and nearly homogeneous sample, external validity, or generalization of the results to populations of differing ethnicities, men, and younger populations may be questioned.

Setting/treatment interaction. This threat was not controlled for because participants may not do as well at a different location or with different implementers. This threat would have to be tested in later replication studies.

History/treatment interaction. This threat was controlled for by limiting the generalization of the results of this study to the specific time period of January 2007 through June/July 2009. All participants in the study were participants in that same time period.

Retrospective Research Design

The retrospective "then-and-now" research design testing has advantages of "one-time testing," which may reduce a participant's response shift from pretesting to posttesting (Nimon & Allen, 2007). Conversely, disadvantages of this design include data collection on participants who complete the testing batteries and not from the entire group of program participants. This leads to the assessment of participants who complete the program and the inability to examine information from participants lost to attrition. Attrition information is of particular interest when investigating process evaluation research, as data used for program improvement may be overinflated because they were based solely on participants who complete the program. Further disadvantages associated with this design often include the inability to substantiate the findings of the retrospective predata/postdata due to the lack of prospective traditional pretesting/posttesting data.

Retrospective Self-Report Measures

Although this study was designed to assess the effectiveness of the Build-A-Bone Program with behavior change and impact with regard to reduction in fracture rates, outcomes were determined by self-report of the participants. In addition, these self-reports were conducted retrospectively. Although the uses of retrospective pretests/posttests have been effective for short-term reports over fewer than 6 months, the study can be compromised by memory deficits (Pratt, McGuigan, & Katzev, 2000).

Standardized Measurement

Additional limitations relate to the lack of standardized measurement instruments that are necessary to compare outcomes of different studies exploring osteoporosis prevention. This observation was also noted by Werner (2005) in a comprehensive review of osteoporosis assessment, correlates, and outcomes. Although subscale components from standardized instruments were utilized in this study, difficulties were encountered with the inability to compare outcomes with other studies of similar interest.

Evaluation research is crucial to determine effectiveness and impact and client satisfaction of osteoporosis prevention programs. Currently, there is a lack of evaluation research of osteoporosis prevention programs reporting effectiveness and impact over time. Because the Build-A-Bone Program has never been evaluated for effectiveness, impact, and client satisfaction, this research provides an important contribution for program improvements, looks at future research funding, and disseminates outcome and process evaluation results to other programs and clinics.

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CHAPTER 2

REVIEW OF THE LITERATURE

Significance of the Study

Osteoporosis is the most commonly occurring bone disease, and it affects approximately 55% of the U.S. population over 50 years old (National Osteoporosis Foundation, 2008a). Osteoporosis is often referred to as the "silent" disease because the disease is often not apparent until fractures occur. Osteoporosis is characterized by bone loss, low bone mass, and microarchitecture deterioration—particularly of trabecular bone tissue leading to bone fragility and increased risk of fractures. The National Osteoporosis Foundation estimates that in the United States, 10 million Americans already have osteoporosis and another 34 million have low bone mass (osteopenia), putting them at risk for osteoporosis. Of the individuals experiencing osteoporosis, approximately 80% are women and 20% are men (National Osteoporosis Foundation).

Osteoporosis is a debilitating disease with physical, psychological, and social consequences that significantly affect individual and social well-being. Complications related to osteoporosis include pain, loss of mobility, loss of independence, decrease in quality of life, interference with activities of daily living, and interference with familial relationships (Meadows & Mrkonjic, 2003; Roberto, 2004). Fear of health changes, depression, and anxiety are often reported in women with osteoporosis

(Lydick, Martin, & Yawn, 1996; Silverman, Shen, Minshall, Xie, & Moses, 2007).

Women with osteoporosis are at high risk for bone fracture mainly in the wrist, vertebrae, and hip. A woman's risk of hip fracture is equal to her risk of ovarian, breast, and uterine cancer combined (National Osteoporosis Foundation, 2008a). More than 1.5 million osteoporosis-related fractures occur each year. These fractures are associated with increases in morbidity and mortality and have considerable impact on well-being and quality of life, with more than 40% of women indicating a decrease in perceived health-related quality of life following osteoporotic-related fractures (Bianchi et al., 2005; Cauley, Thompson, & Ensrud, 2000). Moreover, osteoporosis-related fractures account for direct medical expenses (e.g., hospitals, nursing homes, and outpatient services) of an estimated $19 billion. By 2025, experts predict these costs will reach $25.3 billion (National Osteoporosis Foundation, 2008a).

The negative consequences of osteoporosis warrant individual and social attention with efforts directed at disease prevention. Osteoporosis prevention programs in the United States are varied with diverse focus, methods of delivery, and target population. Notwithstanding the importance and value of these programs, there is a lack of research with regard to the effectiveness and impact of these programs in terms of behavior change, increased bone density, and fall reduction over time.

Background and Rationale

The Build-A-Bone Osteoporosis Prevention Program (hereafter referred to as Build-A-Bone Program) was developed in 2005 at the University of Utah Orthopedic

Center in Salt Lake City, Utah. It is an innovative and unique program that is designed to educate participants and provide skills training experiences with regard to how to care for and strengthen their bones in order to optimize bone health, prevent osteoporosis, and reduce falls and risk of fractures. The program is a four-class series of 2-hour sessions held on consecutive weeks within a calendar month. The classes are repeated with new clients eight to nine times each year. Classes are taught by University of Utah Orthopedic Center staff, and topics include bone health and related medications, walking, balance, weight lifting, posture/core strength, and nutrition. Class sizes range from approximately 10 to 15 clients.

According to a search of the research literature and conversations with the Build-A-Bone Program director, there are few osteoporosis prevention programs in the United States (P. Trela, personal communication, March 4, 2009). Current prevention programs utilize formats such as education only (Blalock et al., 2000; Magee, Stuberg, & Schmutte, 2008; Sedlak, Doheny, & Jones, 2000) or education combined with focus on specific osteoporosis risk factors such as strength training (Cussler et al., 2005), balance (Sinaki & Lynn, 2002), nutrition, and physical activity (Wilcox et al., 2009). Other prevention programs utilize a multidisciplinary medical team approach (Blalock et al., 2002; Cerulli & Zoella, 2004; Foldi, Belgeri, Perry, & Gaebelein, 2005; Jamal et al., 1999; Kulp, Rane, & Bachmann, 2004; MacLaughlin et al., 2005; Rolnick, Kopher, Jackson, Fischer, & Compo, 2001; Sedlak, Doheny, Estok, & Zeller, 2005). However, few osteoporosis prevention programs could be located that target multiple prevention components with experiential educational

sessions as presented in the Build-A-Bone Program.

In addition, there is little outcome and process evaluation research to establish the evidence base for effectiveness and impact of brief community outreach osteoporosis prevention interventions. Despite having between 200 and 250 prior participants, the Build-A-Bone Program has never been evaluated for effectiveness on behavior change, reduction in falls, or client satisfaction. This investigation advances osteoporosis prevention, contributes to the research literature on osteoporosis prevention programs, provides an important contribution for program improvements, looks at future research funding, and disseminates results to other programs and clinics.

Review of the Literature

The literature review for this study presents information with regard to osteoporosis, including selected risk factors and associated lifestyle modifications necessary for disease prevention and management. Information about different types of osteoporosis prevention interventions is provided. A discussion of the effectiveness and impact of multifactor experiential educational interventions is offered with a discussion on behavior change over time. The theoretical framework of osteoporosis prevention programs is presented with discussion of evaluation research relevant to osteoporosis prevention programs. An in-depth description of the Build-A-Bone Program is provided, and the discussion summarizes the literature review presenting the importance for the research.

Risk Factors and Lifestyle Modifications

Multiple risk factors have been identified that increase the likelihood of developing osteoporosis and osteoporosis-related fractures. Nonmodifiable risk factors include gender (female), race/ethnicity (i.e., Caucasian, Asian, or Hispanic), older age, thin/small body frame, and family history of osteoporosis or broken bones. Modifiable risk factors include inactive lifestyle, tobacco use, alcohol abuse, lack of adequate calcium and vitamin D, excessive protein, caffeine and sodium intake, and low sex hormones. In addition, medications (e.g., steroids and anticonvulsants) and certain diseases (e.g., gastrointestinal and rheumatoid arthritis) may place an individual at increased risk for osteoporosis (National Osteoporosis Foundation, 2008b).

Women can lose up to 20% of their bone mass in the 5 to 7 years following menopause. Therefore, regular physical activity, including weight-bearing and resistance/strengthening exercises, adequate calcium, and vitamin D intake, should be encouraged—particularly in the early postmenopausal years (National Osteoporosis Foundation, 2008a). Specific nonmodifiable and modifiable risk factors with associated lifestyle modifications relevant to this research include age, calcium and vitamin D, medications, exercise/physical activity, and fall prevention/fracture reduction.

Age. Age is the most important risk factor for predicting low bone mineral density (BMD) even after controlling for prior fracture and number of years since menopause (Siris et al., 2001). The prevalence of low bone density increases

considerably with age across all ethnicities. Between the ages of 50 and 59 years, 37% of women are affected, 50% of women are affected between the ages of 60 and 69 years, 75% of women are affected between the ages of 70 and 79 years, and 87% of women over age 80 are affected with low bone mass (Centers for Disease Control and Prevention, 2006).

The aging process presents complex issues to osteoporosis prevention and treatment. Diagnosis and treatment are often based on factors of limited financial resources, limited availability of therapy, comorbidities, and the ability of the individual to comprehend osteoporosis prevention and follow prescribed treatment.

Exercise/balance/physical activity. Regular physical activity increases bone strength, enhances muscle strength and endurance, and is necessary for bone health across the life span. Studies have shown that older individuals adapt to endurance and resistive exercise training similar to younger individuals (Rogers & Evans, 1993). Further, researchers have shown that older adults with greater physical activity have a 20% to 40% lower risk of hip fractures than individuals who participate in little or no exercise (Gregg, Pereira, & Caspersen, 2000).

Physical activity enhances balance and gait ability as well as reaction time, which may decrease the risk of falls (Centers for Disease Control and Prevention, 2005). However, approximately 60% of older adults are inactive and lack regular exercise despite indications that physical inactivity is an established risk factor for hip fracture (Centers for Disease Control and Preventions, 2007; Cummings, Nevitt, & Browner, 1995).

The National Osteoporosis Foundation (2008c) provides recommended guidelines for regular weight-bearing and muscle-strengthening (resistance) exercises to strengthen bone and decrease the risk of fracture. Recommendations are for adults to engage in moderate intensity physical activities for at least 30 minutes on 5 or more days a week (Centers for Disease Control and Prevention, 2007). Examples of weight-bearing exercises include walking, jogging, and stair climbing; and resistance exercises include weight lifting with free weights or weight machines.

Calcium. Calcium is the most important nutrient for achieving peak bone mass and preventing and treating osteoporosis (National Osteoporosis Foundation, 2008d). As women approach menopause, calcium needs increase due to declining ovarian estrogen production that results in a decreased ability to efficiently utilize dietary calcium (Kanis, 1999). Researchers have shown that calcium can decrease bone turnover and decelerate bone loss as well as increase the effect of exercise on BMD in postmenopausal women (Kanis; Specker, 1996). Further, increased levels of calcium and vitamin D have been shown to lower fracture rates by 35% to 50% and increase BMD by 2% to 10% (Reid, Ames, & Evans, 1995).

Current recommendations for calcium for women are from 1,000 to 1,200 mg daily (National Osteoporosis Foundation, 2008d). Common sources of dietary calcium include dairy products such as milk, yogurt, and cheese as well as calcium-fortified foods such as cereals and orange juice. Calcium supplements may be used when individuals are unable to consume adequate amounts of calcium through dietary sources. Over-the-counter calcium carbonate and calcium citrate are the most common

calcium supplements (Follin & Hansen, 2003).

Vitamin D. Vitamin D is necessary for the intestinal absorption of calcium. Sufficient intake of calcium is essential in order to maintain bone integrity throughout life. Vitamin D is manufactured in the skin, and approximately 15 to 30 minutes of daily sunlight is adequate for vitamin D production. Current recommendations for vitamin D intake for women are 400 to 600 international units (National Osteoporosis Foundation, 2008e). Low levels of vitamin D have been found in obese individuals, and women with increased skin pigmentation may be at increased risk for vitamin D deficiency (Chen et al., 2007; Florez, Martinez, Chacra, Strickman-Stein, & Levis, 2007).

Medications. Pharmacologic therapy in combination with calcium and vitamin D supplementation is recommended for individuals with low-trauma fracture or individuals who are at high risk for osteoporotic fractures (National Osteoporosis Foundation, 2008e). Medications approved by the Federal Drug Administration for prevention and treatment of osteoporosis include bisphosphonates, selective estrogen modulators, calcitonin, and parathyroid hormone (Forteo®).

Medications to treat and prevent osteoporosis fall into two categories: (a) drugs that stimulate bone formation (i.e., anabolic agents) and (b) drugs that inhibit bone resorption (i.e., antiresorptive agents; Follin & Hansen, 2003). Bisphosphonates such as ibandronate (Boniva®), alendronate (Fosamax®), and risedronate (Actonel®) have been found to increase bone density and slow the rate of bone loss. Selective estrogen modulators (raloxifene) block the action of estrogen in certain tissues by occupying

estrogen receptors inside the cells. A naturally occurring hormone, calcitonin, helps regulate calcium levels in the body and slows the rate of bone loss. In addition, parathyroid hormone (Forteo®) increases the rate of bone formation and is used to treat postmenopausal women with severe osteoporosis who are at high risk for bone fracture (National Osteoporosis Foundation, 2008e).

Fall Prevention/Fracture Reduction

The clinical outcome of osteoporosis is bone fracture. Therefore, fall prevention and fracture reduction are foundational to osteoporosis research for maintenance of independence and quality of life. Interventions targeting fall prevention/fracture reduction are designed to benefit individuals by increasing or at least maintaining bone density as well as increasing physical activity, strength training, balance, and exercise for reduction in falls.

In general, the greatest predictor of osteoporotic-related fracture is BMD (Miller, Zapalowski, Kulak, & Bilezikian, 1999). BMD testing is used to account for approximately 70% of bone strength (Tucci, 2006). Calcium and vitamin D have been shown to increase BMD by 2% to 10% and lower fracture rates by 35% to 50% (Reid et al., 1995). Fall prevention/fracture reduction is important at any age, but it is particularly important for older individuals with osteoporosis. Falls in older adults may be precipitated by comorbidities; medications such as sedatives or muscle relaxants; and decreased vision, hearing, muscle strength, and coordination (National Osteoporosis Foundation, 2008a).

Antifracture prevention and therapy consist of hormone replacement, osteoporotic medications, and environmental modifications. Notwithstanding the personal and social consequences of injury from falls, Ryder et al. (2006) found that approximately 70% of older high-functioning women with an indication for osteoporotic therapy did not start or remain on antifracture therapy.

Types of Osteoporosis Interventions

Health promotion and education interventions are designed to increase knowledge and change behaviors and are valuable to disease prevention and management. Interventions targeting osteoporosis prevention and management may provide (a) education only; (b) education targeting specific risk factors; (c) multidisciplinary medical team approach; and (d) education utilizing multicomponent, experiential skills training sessions.

Educational Interventions

Education is crucial for the prevention and treatment of disease. Women obtain osteoporosis information from health-care providers, personal contacts, television, and magazines—with most women desiring to learn more about osteoporosis (Matthews, Laya, & DeWitt, 2006). Despite the interest in osteoporosis and the amount of information available, research indicates that older adults may often receive inadequate information, have an incomplete understanding of osteoporosis, and confuse osteoporosis with osteoarthritis (Burgener et al., 2005; Kulp et al., 2004; Ribeiro, Blakeley, & Laryea, 2000).

Researchers have designed educational interventions to advance knowledge of osteoporosis utilizing various time frames of from 1 to 6 months as well as various delivery methods of educational materials such as information packets, educational videos, Internet, and workshops (Blalock et al., 2000; Foldi et al., 2005; Kulp et al., 2004; Magee et al., 2008; Ribeiro & Blakeley, 2001; Schoenfeld, Ng, Henderson, & Wu, 2010; Sedlak et al., 2000). Results of these studies indicate outcomes of increased knowledge that influences behavior change of calcium and vitamin D intake, increased physical activity, and increased strength training for balance and fall reduction up to 6 months after the intervention. Although the provision of educational interventions may assist with increased knowledge of osteoporosis, researchers have shown that education alone is not enough to change behavior, particularly over time periods between 8 and 12 weeks (Blalock et al.; Bohaty, Rocole, Wehling, & Waltman, 2008).

Educational Interventions Targeting Selected Risk Factors

Educational interventions have been implemented with intent to increase knowledge of osteoporosis in order to change behavior of selected risk factors such as strength training (Cussler et al., 2005), balance (Madureira et al., 2007; Sinaki & Lynn, 2002), and physical activity (Wilcox et al., 2009). Researchers in these studies used tailored interventions, telephone-based counseling sessions, and home-based exercise programs lasting up to 12 months. Researchers of these studies reported positive outcomes of increased strength training, balance, and physical activity. Despite the benefits of this type of intervention, little is known about whether these

programs impact increased bone density and fall reduction over time.

Multidisciplinary Medical Team Approach

Researchers have investigated positive behavior change with interventions utilizing a multidisciplinary team approach of medical clinics and community pharmacies, tailored interventions, and education as an adjunct to BMD screening (Blalock et al., 2002; Cerulli & Zoella, 2004; Foldi et al., 2005; Jamal et al., 1999; Kulp et al., 2004; MacLaughlin et al., 2005; Rolnick et al., 2001; Sedlak et al., 2005).

A team approach of medical clinics and community pharmacies has been investigated to promote osteoporosis education, osteoporosis screening, and BMD testing as well as to increase medication use (Cerulli & Zoella, 2004; MacLaughlin et al., 2005). Results of increased exercise and calcium intake were reported. Although this approach may be favorable due to increased communication among medical professionals and patients as well as high acceptance by the patients, little is known concerning the impact related to increased bone density and fall reduction and effectiveness related to behavior change over time.

Tailored interventions have been utilized to impact knowledge, lifestyle activities, and health beliefs of osteoporosis (Blalock et al., 2002; Sedlak et al., 2005). Tailored interventions are designed with the intent to customize an osteoporosis prevention program to the individual based on individual dual-energy x-ray absorptiometry scan results. Although researchers found tailored interventions did not significantly increase women's knowledge of osteoporosis, this approach was

found to be beneficial by impacting perceived barriers to calcium intake and exercise. Further research is needed to determine if customized interventions based on individual dual-energy x-ray absorptiometry scan results are applicable with diverse populations of women and effective over time.

Other studies have shown that educational materials addressing risk factors, physical activity, prevention, and treatment used as an adjunct to BMD scanning may encourage women to make positive lifestyle changes such as increased calcium and vitamin D as well as a reduction in smoking, alcohol, and caffeinated beverages (Jamal et al., 1999; Rolnick et al., 2001). The inclusion of BMD scanning may provide valuable information with regard to baseline and postintervention numbers of bone density. Researchers of these studies have reported positive outcomes, including an increased number of women increasing calcium and vitamin D intake and initiating hormonal replacement therapy at 6-month follow-up. Limitations of this intervention design include economics of osteoporosis screening and selection bias based on offers for free bone density scans. More research is needed to explore behavior change over time and cost compared with benefit for this type of intervention.

Although these interventions provide valuable service and are positively correlated with specific outcomes related to osteoporosis prevention, little is known about whether these interventions impact behaviors over time, reduce falls and prevent fractures, and support behavioral theories.

Multicomponent, Educational, and Experiential Interventions

Although various osteoporosis prevention programs provide education only or education with target on single prevention factors, few programs employ a multifactor, educational, experiential, skills training approach over time that targets multiple risk factors, including calcium, vitamin D, exercise, and balance. Only five studies could be located that utilize this type of prevention program approach (Brecher et al., 2002; Davis, White, & Yang, 2006; Francis, Matthews, Van Meechelen, Bennell, & Osborne, 2009; Pearson, Burkhart, Pifalo, Pallago-Toy, & Krohn, 2005; Sedlak et al., 2000); however, none used retrospective predata/postdata collection or a quasi-experimental correlational or post hoc statistical design. Each of these studies is summarized below in order to provide further insight related to the participants, program format, and outcomes.

Pearson et al. (2005) conducted an outcome evaluation on a community-based osteoporosis prevention program with the purpose to determine education retention and adherence to lifestyle changes that would reduce the risk for osteoporotic fractures. Prior to enrollment, participants received a free dual-energy x-ray absorptiometry screening and interviews with an exercise physiologist and a registered dietitian. Participants completed 40 hours over 8 weeks of supervised exercise, educational activities, individual consultations, and group support sessions. Participants were required to submit weekly logs of exercise, strength training, and nutrition. The research design was a nonexperimental one-group (n = 375) pretest/posttest, with assessments at the end of the 8-week program, 6 months, and 2

years following completion of the program. Medication records were kept on each participant and updated at each assessment, and a free dual-energy x-ray absorptiometry screening was provided at the end of the program. Results of this study showed at the end of the 8-week program significant improvement over baseline measures in depression, osteoporosis knowledge, adherence to nutrition and exercise recommendations, and improvements in upper and lower body strength, flexibility, and balance. At 6 months postintervention, outcomes showed significant improvement in measures of flexibility, body strength, balance, nutrition, and exercise adherence over baseline. At 2 years postintervention, exercise, calcium, and vitamin D increased significantly from baseline, and the increase was maintained at 6-month and 2-year assessments. Further, the researchers noted that the participants experienced a 3% increase in 2-year BMD of the spine, indicating that factors such as increased consumption of vitamin D and calcium may have also contributed to an increase in BMD. Additional research was recommended to determine the impact of a multifactor intervention program. This comprehensive, multifactor study over 2 years provided insight into the current study with regard to change over time with increased exercise, calcium, vitamin D, and BMD. Participants maintained changes over time; however, integration of theory or behavior change models were not reported.

Similarly, Davis et al. (2006) conducted a study investigating the effectiveness of knowledge and healthy behaviors over three postintervention assessment periods of 1 week, 6 weeks, and 7½ months. Forty-seven participants completed six 1-hour weekly educational sessions focused on education with regard to osteoporosis,

physical activity, fall prevention, nutrition and nutritional supplements, and medications and nutritional supplements. In addition, training was provided with regard to exercising for strength, balance, and flexibility. Results of this study showed significant changes in knowledge and behaviors (i.e., calcium intake and exercise for fall reduction) between pretest/posttest; however, changes between the other assessment periods of 6 weeks and 7½ months were not significant. Further, behaviors of consuming foods high in vitamin D and weight-bearing exercise did not change significantly during the study. An unexpected outcome of the study was that over the course of the study nearly one third of the participants took self-initiated action to obtain a dual-energy x-ray absorptiometry scan. Limitations noted by the researchers include limited diversity between settings and the pretest/posttest design with lack of a control group. The researchers suggested that because overall behaviors of exercise fall prevention were not significant postintervention, follow-up reinforcement at 3 months would be appropriate.

Sedlak et al. (2000) investigated the implementation and program evaluation of an osteoporosis prevention program incorporating knowledge, health beliefs, and frequency of osteoporosis prevention behaviors (e.g., dietary, calcium, weight-bearing exercise, and decreased caffeine intake) for 84 women. The study was designed to explore three levels of intensity for delivery of the information based on different needs and different risk factors for osteoporosis. One group experienced three 1-hour sessions over 3 weeks, one group experienced one 3-hour session, and one group experienced a 45-minute continuing education program. The study design included a

pretest and follow-up posttesting at 3 weeks postintervention. Results of this study indicated significantly higher levels of knowledge with each group; however, overall, there was no change in health beliefs or behaviors. Although the researchers suggested assessment of readiness for learning and behavior change in future osteoporosis prevention programs, the length of the intervention with a multifactor approach was not addressed.

Brecher et al. (2002) conducted evaluation research investigating the effectiveness of an osteoporosis prevention program on knowledge, calcium intake, and exercise. Participants (N = 110) included women ages 25 to 75. The program consisted of a brief, 3-hour session covering epidemiologic factors of osteoporosis, dietary recommendations and interactive exercise, posture and resistance training, and exercise to reduce risk of injury. The research design utilized treatment and control groups with assessments at 2 weeks and 3 months. Results indicated that although there was a significant change in knowledge over time between the groups, no statistically significant group differences were identified with behaviors (i.e., exercise and weekly dietary calcium intake) or beliefs (i.e., osteoporosis and exercise, perceived susceptibility, and self-efficacy). Brecher et al. suggested further investigation utilizing an interactive multifactor prevention model for a longer time period in order to identify the length of time for maximum impact.

Francis et al. (2009) provided additional information by conducting outcome evaluation research examining the effectiveness of an osteoporosis education and self-management intervention designed to provide education and skills related to

osteoporosis prevention. Participants (N = 198) included women (92%) ages 40 and older. The program also included weekly sessions of from 2 to 2½ hours over 4 weeks and covered topics of general osteoporosis, physical activity, nutrition, posture, goal setting, and problem solving. The researchers employed a randomized treatment/control research design with assessment at 6 weeks postintervention. Results showed statistically significant increases in knowledge and health-directed behavior skills; however, no improvement was seen in calcium, exercise, and self-efficacy scores. Francis et al. suggested further research with regard to longer term follow-up and reduction in falls and fractures.

Results of these five studies indicate that the multicomponent educational and skills training program approach is effective for osteoporosis prevention. A major conclusion of the research is that short-term or low-dosage programs such as the 3-hour dosage programs can achieve increases in knowledge but are not effective in changing behavior. Only two of the studies utilized a true randomized control group; thus, it is difficult to determine if the programs impacted changes in the clients. None of these five programs measured reduction in falls or overall reductions in risk such as this study did; therefore, results are inconclusive of knowledge and behavior change over longer periods of time and impact related to increased bone density and fall reduction. Further, none of the studies used a quasi-experimental, correlational, or post hoc statistical design that allowed the researchers to determine for which types of clients the programs were most effective (see Table 2.1).

Table 2.1

Multicomponent Experiential Skills Training Osteoporosis Prevention Programs

	Program length	Study components	Research design	Number of participants	Measures	Assessment periods	Results
Brecher et al. (2002)	-One 3-hour session	-Osteoporosis education -Medical issues, dietary recommendations, exercise, posture, and fall reduction	-Experimental randomized treatment/control	$N = 110$	-Short Food Frequency Questionnaire -Minnesota Leisure Time Physical Activity Questionnaire -Osteoporosis Self-Efficacy Calcium Scale	-2 weeks -3 months	-Statistically significant increases at 3-month follow-up test in knowledge -No significant difference behaviors (exercise and weekly dietary calcium intake) or health beliefs
Davis et al. (2006)	-6 hours or -Six 1-hour weekly sessions	-Osteoporosis education, bone health -Exercise, balance, and flexibility -Self-management behaviors	-Nonexperimental pretest/posttest and 6 weeks, 7.5 months follow-up test	$n = 47$	-Osteoporosis Knowledge Questionnaire -The Timed Up and Go Test -Osteoporosis Self-Management Index-Revised -The Short Food Questionnaire -The Falls Efficacy Scale	-1 week -6 weeks -7.5 months	-Statistically significant increases at 6-week posttest in knowledge, exercise, and calcium -Statistically significant increases at 7.5 months in fall precautions, exercise, and balance -Overall, no significant changes in vitamin D and weight-bearing exercises

Table 2.1 (*continued*)

	Program length	Study components	Research design	Number of participants	Measures	Assessment periods	Results
Francis et al. (2009)	-Four 2-hour weekly sessions	-Osteoporosis education, health-directed behaviors with regard to exercise, nutrition, falls prevention, exercise, posture, and self-efficacy	-Experimental randomized treatment/control	n = 198	-Osteoporosis Knowledge Assessment Test -Health Education Impact Questionnaire -Osteoporosis Self-Efficacy Scale	6 weeks	-Statistically significant increases in knowledge and health-directed behaviors -No significant change in calcium, exercise, or self-efficacy
Pearson et al. (2005)	-40 hours over 8 weeks	-Osteoporosis education -Supervised exercise, educational activities -Individual consultations -Group support sessions	-Nonexperimental pretest/posttest and 8-week, 6-month, and 24-month follow-up test design	N = 375	-Dual-energy x-ray absorptiometry scan -Osteoporosis knowledge -Center for Epidemiologic Studies Depression Scale -Functional Fitness Test Battery for Older Adults	-8 weeks -6 months -2 years	-Statistically significant increases up to years in exercise, calcium, and vitamin D
Sedlak et al. (2000)	-Three 1-hour sessions over 3 weeks -One 3-hour session -One 45-minute session	-Osteoporosis education, health beliefs, calcium, exercise, and caffeine intake	-Nonexperimental pretest/posttest	n = 84	-Osteoporosis Knowledge Test -Osteoporosis Health Belief Scale -Osteoporosis Preventing Behaviors Survey	-3 weeks	-Statistically significant increases at 3-week posttest in knowledge -No change in health beliefs or behaviors

Research is limited with regard to program outcome evaluations of osteoporosis interventions with five multicomponent, experiential, educational osteoporosis prevention programs reporting program evaluations (Brecher et al., 2002; Cerulli & Zoella, 2004; Davis et al., 2006; Francis et al., 2009; Pearson et al., 2005; Sedlak et al., 2000). Despite varying time frames, methods of delivery, and assessment, researchers of these programs report beneficial outcomes of effectiveness related to increased knowledge and behavior change with regard to increased exercise, calcium, and vitamin D intake. Further, impact related to increased bone density has been reported.

Inasmuch as osteoporosis is a complex disease with multiple and complex risk factors, interventions addressing multiple aspects of the disease may provide maximum benefit to the participant. However, more research is needed to investigate the effectiveness on behavior change and impact on fall reduction over time of osteoporosis prevention programs utilizing a multifactorial, educational, experiential design.

Behavior Change Over Time

Vital to the success of a prevention program is the determination of impact and effectiveness with regard to knowledge retention and behavior change over time. In terms of osteoporosis, effectiveness indicates increased knowledge and behavior change; the impact indicates a reduction in falls and fractures.

Researchers have explored the effectiveness of short-term osteoporosis interventions ranging from one 3-hour session to six weekly sessions in which

education was provided with regard to general osteoporosis knowledge, nutrition, exercise, balance, and flexibility (Brecher et al., 2002; Davis et al., 2006; Sedlak et al., 2000). Results from these studies suggest that short-term interventions of approximately 1 to 6 hours positively impact knowledge of osteoporosis and prevention strategies at assessment periods of 3 weeks to 7 months postintervention. Despite the positive effectiveness of short-term interventions to increase knowledge related to osteoporosis, results from these studies indicate no significant behavior change postintervention with nutrition, exercise, balance, and flexibility.

Long-term osteoporosis prevention interventions have been investigated for osteoporosis-related knowledge retention and behavior change (Pearson et al., 2005). Program designs consisting of 8 weeks of educational activities, supervised exercise, and group sessions have shown significant improvement in osteoporosis knowledge and behavior changes with regard to nutrition, exercise, flexibility, and balance at the conclusion of the intervention and 6 months postintervention. At 2 years postintervention, behaviors of increased exercise, calcium, and vitamin D increased significantly over baseline, with the participants experiencing a 3% increase in BMD of the spine. Periods longer than 2 years have not been investigated with regard to osteoporosis-related knowledge retention and behavior change.

Researchers investigating knowledge retention and behavior change over time have provided insight of effectiveness and impact post-short-term and long-term intervention. Notwithstanding the beneficial information provided with previous research focused on osteoporosis prevention and behavior change over time, more

research is needed to support these findings and answer questions such as the following: What are the correlates of positive outcomes? Do program participants maintain behavior change over time? Did the program impact bone density and fall reduction over time?

Theoretical Framework and Osteoporosis Prevention Interventions

Theoretical frameworks are fundamental to drive assessment, implementation and evaluation of health promotion, and education interventions. The role of theory in terms of behavior change is to facilitate determination of how change will occur and the function that an intervention can play in assisting that change (Siegel & Doner, 1998). Further, behavior change theories are valuable to provide framework in order to identify determinants of specific behaviors (Fishbein & Cappella, 2006).

Researchers exploring osteoporosis prevention have utilized various models and intervention theories as foundation to support behavior change. These models include the social cognitive learning theory model (Bandura, 1986), health belief model (Rosenstock, 1974), transtheoretical model of behavior change (Prochaska, DiClemente, & Norcross, 1992), and precaution adoption process model (Weinstein, 1988). Each of these intervention theories is described below.

Social Cognitive Learning Theory Model

Almost all behavior change interventions that involve direct skills training are based on the social cognitive learning theory model as elaborated by Bandura (1986). This theory states that people's behaviors can change if they are shown the new

behaviors and are taught the steps to implementing the desired behavior change. When people implement the new behavior, they are praised or rewarded for the new behavior. They can also learn vicariously by watching others learn the new skills and get reinforced for the new behavior. Identification with the other person who is demonstrating the new skill is also helpful. Participants in a program who believe they are like the person who is demonstrating the new skill are more likely to try to implement the new skill. Hence, if using videotapes to teach a new skill or direct practice in a classroom, it helps if the person demonstrating the new skill is perceived to be similar to the participants in the class. Rewarding and praising small improvements in the new skill are helpful as well as home practice or homework assignments to conduct the new skills at home or work.

The Build-A-Bone Program has most of the components of an effective skills training program that includes group learning, positive praise for small improvements in demonstrating the new behavior and homework assignments, or monitoring how often the clients demonstrated the new skill outside the classroom.

Health Belief Model

The health belief model (Rosenstock, 1974) is one of the most widely used conceptual frameworks in health promotion and education. The health belief model states that behaviors change when individuals regard themselves as susceptible to the condition, whether they believe there are potentially serious consequences, whether they believe that an available course of action would be beneficial in reducing either the severity or susceptibility of the condition, and whether they believe that

anticipated barriers or impediments to taking action outweigh the benefits. In addition, the health belief model states that individuals must feel competent (self-efficacious) in order to overcome perceived barriers to taking action (Glanz, Rimer, & Lewis, 2002).

The health belief model has provided insight with regard to beliefs of barriers of exercise and calcium intake for young adult women (Chang, 2006; Taggart & Connor, 1995; Wallace, 2002), concluding that perceived barriers are predictors to behaviors of exercise and calcium intake. In addition, researchers have concluded that although women believe osteoporosis is a serious condition, most women do not perceive a personal susceptibility to the disease (Burgener et al., 2005; Hsieh, Novielli, Diamond, & Cheruva, 2001). Other studies have indicated that women who believed their bone density test results did not show osteoporosis as well as women's beliefs about the necessity of treatment, medication safety, cost of treatment, and treatment goals appear critical to osteoporosis treatment selection and adherence (Tosteson et al., 2003; Unson et al., 2003).

Researchers have emphasized the role of theory in understanding osteoporosis prevention (Werner, 2005). Recommendations include the health belief model as a framework for osteoporosis prevention programs by increasing constructs of perceived susceptibility, perceived severity, perceived benefits, self-efficacy, and cues to action while decreasing perceived barriers to actions (Turner, Gray, Hunt, & Jones, 2004). Notwithstanding the value of incorporating theory into health promotion and educational interventions, health beliefs based on the health belief model may not be impacted or changed by short-term interventions (Sedlak et al., 2000). The impact of

the Build-A-Bone Program on changes in health beliefs were measured using the Osteoporosis Health Belief Scale (Kim, Horan, Gendler, & Patel, 1991). This instrument was specifically developed to measure health beliefs related to osteoporosis (Burgener et al., 2005; Hsieh et al., 2001; Shanthi, McLeod, Kennedy, & McLeod, 2008) and measures seven subscales, including perceived susceptibility, seriousness, benefits of exercise and calcium intake, barriers to exercise and calcium intake, barriers to exercise and calcium intake, and health motivation.

Transtheoretical Model of Behavior Change

The transtheoretical model of behavior change (Prochaska et al., 1992) provides another perspective into behavior change and osteoporosis prevention behaviors. This model conceptualizes behavior changes across five stages, including precontemplation, contemplation, preparation, action, and maintenance. Researchers have investigated the model for application to osteoporosis and preventive behavior change (Mauck et al., 2002; Popa, 2005; Tucker, Snelling, & Adams, 2002). Results of these studies indicate that the model has application for behaviors such as calcium intake and exercise. However, results are inconclusive with regard to the application of this model over other theories and models and for behaviors of caffeine and alcohol reduction, strength training, and balance exercises. Hence, I did not measure the participants' readiness to change but did measure their actual behavior change.

Precaution Adoption Process Model

The precaution adoption process model (Weinstein, 1988) has been investigated in order to understand why many women do not practice behaviors that could potentially reduce individual risk of developing osteoporosis. This model suggests behavior change as a process that develops over time based on seven stages with respect to the adoption of a specific precaution. These stages include the following: (a) lack of awareness of a health problem as well as of the recommended precaution to reduce risk of experiencing the problem, (b) awareness of the health problem and precaution but lack serious consideration to adopt the precaution, (c) consideration of adoption of the precaution with the decision not to adopt the precaution, (d) indecision with regard to adoption of the precaution, (e) decision to adopt the precaution, (f) action on the decision to adopt the precaution, and (g) maintenance of the precaution for a substantial period of time. Blalock, DeVellis, Giorgino, DeVellis, and Gold (1996) used the model to examine predictors of the behaviors of calcium and exercise based on 12 predictor variables. Results showed an association of calcium with 11 of the 12 variables and 8 of the 12 variables with exercise suggesting the applicability of the precaution adoption process model to research with regard to osteoporosis. Because participants in the Build-A-Bone Program were likely to be in Stages 6 or 7, since they had adopted the precaution of attending a prevention class to learn techniques and exercises to reduce their risk of falls or osteoporosis, I did not measure their stage of adoption of the precaution.

Theories can explain behavior and suggest ways to achieve behavior change. However, many osteoporosis prevention programs are developed and implemented without theoretical foundation, potentially weakening effectiveness and impact of the results (Werner, 2005). Four theories have been discussed with inconclusive results with regard to which theory or model is more applicable to one behavior over another or to one population over another. Moreover, even though various osteoporosis prevention programs have utilized a theoretical foundation, many of these programs lack evaluation research to establish an evidence base for research investigating the effectiveness of brief community outreach prevention interventions that focus on osteoporosis prevention. More research is needed to investigate the application of behavioral theory with osteoporosis prevention programs.

Evaluation Research and Osteoporosis Prevention Programs

Evaluation research is crucial to successful health promotion and education interventions in order to determine whether interventions have had the intended impact, what the degree of the impact is, whether interventions have been effective, and how the effectiveness was achieved (Valente, 2002). Evaluation research encompasses process evaluation based on formative research in the assessment and preintervention stages of program development and outcome evaluation at postintervention stages to determine effectiveness and impact of the intervention. I conducted both a process and an outcome evaluation of the Build-A-Bone Program after discovering that many of the prior researchers either did not conduct or report thorough process evaluation research for their studies. In the following sections, I

document the prior process evaluations conducted on osteoporosis prevention programs.

Process Evaluation

Process evaluation research is vital to the development and implementation of effective osteoporosis prevention interventions. Results can be used to help document program implementation, program improvements, potential research funding, and dissemination of results to other programs and clinics. Process evaluations measure whether the program was implemented as planned with fidelity and quality. A thorough process evaluation reports on what happened in the actual implementation of an intervention, including who were the clients (e.g., numbers, types, and demographics), what techniques were successful to recruit and engage participants in the intervention, and what was the participants' attendance and number of sessions completed. A process evaluation can also measure client satisfaction with the program and recommendations for improvement. Process evaluation research can answer questions, including the following: Do client's outcomes improve with increased attendance? What are the correlates of high client satisfaction compared with clients with low client satisfaction? Does the program match the needs of the participants?

Process evaluation research that pertains to community outreach osteoporosis prevention programs is limited. Only three studies could be located in which process evaluations have been conducted and reported (Curry, Hogstel, Davis, & Frable, 2002; Gold & Silverman, 2004; Turner et al., 2004). The interventions utilized a program design of a short educational program to multicomponent, experiential skills

training with four to five classes over approximately 2 months. Program content included screenings, lecture presentations, consultations, and group exercises over time periods of one session lasting 30 minutes to 5½ hours to 15 hours over a 5- to 10-week period. Results of these studies suggest high client satisfaction with the respective program format, course content, and length of the interventions despite the variability in program delivery and implementation. Suggestions for program improvement included provision of a follow-up program, nutritional counseling, and additional demonstrations of exercises. Little is known, however, about participants' outcomes improving with increased attendance and demographic correlates of high client satisfaction.

The lack of evaluation research suggests that many osteoporosis prevention interventions are implemented without comprehensive process and outcome evaluation procedures or that process and outcome evaluations may be conducted and not reported. Barriers such as cost and fear must be addressed and overcome in order to confirm results of health promotion and educational interventions, including osteoporosis prevention programs.

Although this discussion provides valuable information of process and outcome evaluation research and osteoporosis prevention programs, further evaluation research is needed in order to validate findings from previous studies related to processes of program implementation and correlates of positive outcomes.

Build-A-Bone Osteoporosis Prevention Program

Program Description

The Build-A-Bone Program is a community outreach, multicomponent, experiential, educational intervention. The Build-A-Bone Program was developed by Patty Trela, PT, DPT, CMPT, in October 2005 at the University of Utah Orthopedic Center in Salt Lake City, Utah. The Build-A-Bone Program is an innovative and unique program that is designed to educate participants about how to care for and strengthen their bones in order to optimize bone health, prevent osteoporosis, and reduce falls and risk of fractures. In addition, the program is designed to provide interactive, experiential learning with regard to walking, balance, weight lifting, and core strength.

The Build-A-Bone Program is a four-class series of 2-hour sessions held on Tuesdays and Saturdays on consecutive weeks within a calendar month eight to nine times each year. This format was selected in order to minimize information overload in a session and to provide weekly variety with exercises and didactic material. Participants live in residential settings with ages generally ranging from 20 to 80 years. The cost of the program is $125.00, which includes a pedometer and weekly handouts.

Classes are held at the University of Utah Orthopedic Center with class sizes of between 10 and 15 participants. Classes are taught by University of Utah Orthopedic Center staff, including physicians, physical therapists, dieticians, and nurse practitioners. Topics include bone health and related medications, walking,

balance, weight lifting, posture/core strength, and nutrition. Behavior change is discussed in each class, and feedback is provided for correct exercise technique and is modified for individual circumstances. Homework assignments include recording steps with a pedometer and the challenge to increase steps by 20% each week until the goal for the number of steps each day is met.

Build-A-Bone Osteoporosis Prevention Program Curriculum

Following is a description of the Build-A-Bone Program:

1. Week 1: exercise and bone health (i.e., normal bone, osteopenia, osteoporosis, and research on exercise); posture and body mechanics (i.e., spine alignment, posture [sit/stand, posture during functional activities, and posture], and exercise)
2. Week 2: walking (i.e., benefits, techniques, 10,000 steps, shoes, and intensity) and balance (i.e., proprioception, vision, ear, balance exercises, and flexibility for legs)
3. Week 3: medical (i.e., fracture risk, medications to treat osteoporosis, and dual-energy x-ray absorptiometry scan) and weight lifting (i.e., isotonic exercise for arms and legs
4. Week 4: core strength (i.e., back extension exercises and abdominal exercise without spine flexion) and nutrition (i.e., all foods and vitamins beneficial and detrimental to bone).

Despite benefits of the Build-A-Bone Program by increasing knowledge of osteoporosis and providing experiential skills training, the program has never been evaluated for impact or effectiveness of osteoporosis prevention or health beliefs over time. Further, the program has never been investigated for client satisfaction and participant recommendations for improvement.

Discussion

Prevention, early recognition (particularly in perimenopausal years), and appropriate treatment can significantly decrease morbidity, mortality, and health-care costs related to osteoporosis. Whereas lifestyle modifications are necessary to diminish modifiable risk factors, reduce the progression of osteoporosis, and prevent future osteoporotic-related fractures, there is a significant need to promote education, healthy behaviors, and lifestyle modifications associated with osteoporosis.

Although options are available with regard to osteoporosis prevention programs today, the above discussion leads to various unanswered questions with regard to the efficacy and impact of currently available programs and interventions. Despite the review of the literature, the following questions remain: Do program participants maintain positive behavior changes over time and has their history of falls improved? What are the correlates of positive outcomes? Did the program influence health beliefs with regard to osteoporosis, bone density, and fall reduction? What are the outcomes of clients who attended all program sessions compared with those who did not attend all program sessions? What are the correlates of high client satisfaction compared with clients with low client satisfaction? Do the programs match the needs

of the participants? Further research is needed to address these questions and the ever-increasing need for osteoporosis prevention.

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CHAPTER 3

OUTCOME EVALUATION AND THE BUILD-A-BONE OSTEOPOROSIS PREVENTION PROGRAM

Background and Significance

Osteoporosis is the most commonly occurring bone disease that affects approximately 55% of the U.S. population over 50 years old, with 80% of those individuals being women (National Osteoporosis Foundation, 2008). The National Osteoporosis Foundation estimates that in the United States 10 million Americans already have osteoporosis and another 34 million have low bone mass (osteopenia)—putting them at risk for osteoporosis. Osteoporosis is referred to as a "silent" disease that can remain undetected until fractures or falls occur unless a dual-energy x-ray absorptiometry scan is conducted based on family history or risk factors. Experts estimate that approximately one in four men and one in two women over the age of 50 will experience an osteoporosis-related fracture in their lifetime (National Osteoporosis Foundation).

Debilitating complications related to osteoporosis include pain, loss of mobility, loss of independence, decrease in quality of life, interference with activities of daily living, and interference with familial relationships (Meadows & Mrkonjic, 2003; Roberto, 2004). Fear of negative health changes, depression, and anxiety are often reported in women with osteoporosis (Lydick, Martin, & Yawn, 1996;

Silverman, Shen, Minshall, Xie, & Moses, 2007).

Osteoporosis is preventable and treatable. Health promotion and education interventions are valuable to disease prevention and management with the potential to increase knowledge and change behaviors. Notwithstanding the importance of these programs, there is a lack of research with regard to the effectiveness and impact of these programs in terms of behavior change and fall reduction over time.

The Build-A-Bone Osteoporosis Prevention Program (hereafter referred to as Build-A-Bone Program) was developed in 2005 at the University of Utah Orthopedic Center in Salt Lake City, Utah. It is an innovative and unique program that is designed to educate participants and provide skills training experiences with regard to how to care for and strengthen their bones in order to optimize bone health, prevent osteoporosis, and reduce falls and risk of fractures. The program is a four-class series of 2-hour sessions held on consecutive weeks within a calendar month. The classes are repeated with new clients eight to nine times each year. Classes are taught by University of Utah Orthopedic Center staff, and topics include bone health and related medications, walking, balance, weight lifting, posture and core strength, and nutrition. Class sizes range from approximately 10 to 15 clients.

The purpose of this study was to develop new knowledge on osteoporosis prevention with regard to effective ways to reduce risk behaviors and promote increased healthy behaviors in order to reduce falls in people living with or at risk of osteoporosis by conducting an outcome and a process evaluation study of the Build-A-Bone Program at the University of Utah Orthopedic Center in Salt Lake City, Utah.

The program was evaluated for effectiveness (i.e., behavior change), impact (i.e., fall reduction), and correlates of client satisfaction.

Research Aims

Specific Aim 1

Specific Aim 1 is to conduct a 2.5-year retrospective analysis of the long-term effectiveness and impact of the Build-A-Bone Program by conducting survey research and comparing self-reported clinical record outcomes of approximately 100 clients. Outcomes include the following: (a) behavior change with regard to physical activity (e.g., walking, balance, weight lifting, and core strength) and nutrition and dietary patterns (e.g., calcium intake; vitamin D intake; caffeine and alcohol consumption; and sodium, protein, and wheat bran intake); (b) reduction in number of modifiable risk factors; and (c) reduction in falls.

Specific Aim 2

Specific Aim 2 is to collect survey data on participant demographic information, correlates of client satisfaction, and ideas for program improvement.

Research Questions and Hypotheses

Specific Aim 1: Subgroup Main Effect
Research Questions

Research Question 1. Do program participants improve their positive risk reduction behaviors after program participation from pretest to posttest?

1. Hypothesis 1: Program participants will improve their positive risk reduction behavior after program participation.
2. Null Hypothesis 1: Program participants will not improve their positive risk reduction behavior after program participation.

Design: A one-group pretest/posttest design. The measurement indicator is scores on the osteoporosis risk assessment:

Group 1: O X.

Research Question 2. Does the program participant's history of falls improve from pretest to posttest?

1. Hypothesis 2: The program participant's history of falls improves from pretest to posttest.
2. Null Hypothesis 2: The program participant's history of falls will not improve from pretest to posttest.

Design: A one-group pretest/posttest design. The measurement indicator is scores on the falls assessment:

Group 1: O X.

Research Question 3. Does the client risk level at program entry measured by the osteoporosis risk assessment result in larger positive outcomes as measured by impact on falls, increased physical activity, and improved nutrition?

1. Hypothesis 3: Clients with the greatest number of risk factors at program entry will improve more than those with fewer risk factors.
2. Null Hypothesis 3: Clients with the greatest number of risk factors at program entry will not improve more than those with fewer risk factors.

Design. A retrospective cohort study was used with a 2 group X 2 pretest/posttest measure, post hoc, quasi-experimental subgroup analysis comparing participants with high-risk levels at the Build-A-Bone Program entry with those with lower risk levels. The measurement indicator for risk level is scores on the osteoporosis risk assessment:

High-risk participants: O X O

and

Low-risk participants: O X O.

Research Question 4. Does dosage (i.e., attendance) affect measured osteoporosis health outcomes (i.e., reduction in risk factors and falls; and improvement in physical activity, balance, nutrition and dietary patterns, and personal health beliefs)?

1. Hypothesis 4: Clients with greater program dosage (i.e., attendance) will have greater reduction in risk factors for osteoporosis, improved behavioral (i.e., physical activity and nutrition), and physical outcomes

(i.e., fall reduction) over time.

2. Null Hypotheses 4: Clients with greater program attendance or greater program satisfaction will not have statistically significant reduction in risk factors for osteoporosis nor improvement in behavioral (i.e., physical activity and nutrition) and physical outcomes (i.e., fall reduction) over time.

Design. A retrospective cohort study was used with a 2 group X 2 pretest/posttest measure, post hoc, quasi-experimental subgroup analysis comparing participants with higher dosage (i.e., attendance) levels at the Build-A-Bone Program entry with those with lower dosage levels. The measurement indicator for dosage level is scores on reported attendance:

High-dosage participants: O X O

and

Lower-dosage participants: O X O.

Research Question 5. Do program participants who have been out of the program longer have better or worse outcomes than those who completed the program more recently? Hence, this question addresses whether the program has long-term impact and benefit for clients or whether the results degrade with time since the program.

1. Hypothesis 5: Clients who completed the program earlier (i.e., in terms of month of enrollment) will have greater reduction in risk factors for osteoporosis, improved behavioral (i.e., physical activity and nutrition), and physical outcomes (i.e., fall reduction) over time.
2. Null Hypotheses 5: Clients who completed the program earlier will not have greater reduction in risk factors for osteoporosis nor improvement in behavioral (i.e., physical activity and nutrition) and physical outcomes (i.e., fall reduction) over time.

Design. A retrospective cohort study was used with a 2 group X 2 pretest/posttest measure, post hoc, quasi-experimental subgroup analysis comparing participants who completed the Build-A-Bone Program earlier in time with those who completed more recently. The measurement indicator is time of enrollment:

Earlier participants: O X O

and

Later participants: O X O.

Specific Aim 2: Process Evaluation Research Questions

1. What was the average attendance in the program?
2. What are the characteristics of the participants who attended the program?
3. What was the overall level of client satisfaction with the program?

4. What are correlates (e.g., client or program characteristics) of high client satisfaction?

5. What are client recommendations for program improvement?

Research Methods

Study Procedures: Participant Numbers and Characteristics

Records of the Build-A-Bone Program participants have been kept by the program staff since January 2007. Participants for this study included all 160 individuals enrolled between January 2007 and April 2009. Of this base, 33 (21%) were unable to be contacted by telephone, e-mail, or U.S. mail and 24 (15%) declined the invitation to participate in the study. One hundred three participants or 64% of the 160 possible participants completed the questionnaire. Study participants included 98% Caucasian, approximately 7% males and 93% females, with ages ranging from 29 to 91 years old.

Participant selection criteria. The inclusion criteria included all participants over the 2.5 years of the program who attended the Build-A-Bone Program for whom I had valid contact information, those who voluntarily signed the Institutional Review Board consent forms giving consent to participate in the research, and those who demonstrated sufficient cognitive ability to accurately respond to the questions in the questionnaire. Since electronic and hard copies of the questionnaires were provided, computer competency was not required to participate.

The exclusion criteria included all participants who had developed mental disabilities (e.g., stroke, Alzheimer's disease, and mental disorder) that would limit their cognitive ability to complete the questionnaire.

Participant enrollment procedure. Institutional Review Board approval for this study was obtained on June 10, 2009. After approval, the Build-A-Bone Program participant registration records were obtained from the University of Utah Orthopedic Center files. The records had been kept by the Build-A-Bone Program staff and included participant's name, address, phone, e-mail, and consent to be contacted with authorization for photograph, film, or interview. Each participant was initially contacted by way of an introduction letter or e-mail based on the availability of information provided at the time of registration in the Build-A-Bone Program (see Appendix A). The participants were then contacted by telephone and provided information about the purpose of the study and an invitation to participate (see Appendix B). If potential participants accepted, the Mini-Mental Screening Exam (Folstein, Folstein, & McHugh, 1975) was then administered to assess the participant's cognitive abilities to accurately respond to the questions in the questionnaire. No participants were excluded from the study based on the Mini-Mental Screening Exam.

Participants in instrument pilot test. The Institutional Review Board approved questionnaire (see Appendix C) was pilot tested with seven women ages 24 to 57 years prior to distribution. The purpose of the pilot test was to determine ease of access to the questionnaire through Surveymonkey.com, length of time to complete,

and clarity of the questions. As the principal investigator for this study, I evaluated the results of the pilot test and determined that the projected length of time to complete the questionnaire was accurate and that the questions were clear and concise. The questionnaire required minimal grammatical and editing corrections before distribution to the participants.

Online and mailed survey methodology. The study participants accessed the questionnaire by way of an electronic link attached to an e-mail (see Appendix D). For those participants who did not have computer access, a hard copy of the questionnaire was sent through U.S. mail with a return, postage-paid envelope. Instructions of study procedures were given to the participants in a cover letter and on the consent page of the questionnaire (see Appendix E and Appendix F). The participants were given 14 days to complete the questionnaire. After 3 weeks, reminder e-mails, phone calls, or both were initiated to participants who had not returned the completed questionnaire (see Appendix G).

Human subjects' rights were protected by having each participant read and electronically sign the informed consent prior to completing the online survey. The informed consent was placed at the end of the cover letter that was attached to the questionnaire (see Appendix E and Appendix F). The participants were given the following direction: "Clicking below indicates that I have read the description of the study and I agree to participate." Participants receiving the mailed questionnaire were instructed that by returning the questionnaire they had read the description of the study and agreed to participate.

SurveyMonkey.com was used for data collection and to manage communication between the participant and the Web server, between the researcher and the Web server, and between the researcher and the participant. Because transfer of information across the Internet is not secure and could be observed by a third party, Secure Sockets Layer protocol was used. An explanation of the technology was provided to the participants during the initial phone contact and questionnaire cover letters. All participants were cautioned with regard to Internet use practices that may put them at risk such as using public computers or failing to close their browsers after completing the questionnaire.

Retrospective data collection. Because only retrospective data could be collected on former program participants who had already graduated, this study relied primarily on utilizing a "then-and-now" data collection procedure. This "then-and-now" procedure has been effectively used in public health studies, particularly with sensitive data such as child abuse or drug use (Rhodes & Jason, 1987), family intervention programs (Pratt, McGuigan, & Katzev, 2000), and nutrition and program evaluation (Raidl et al., 2004; Skeff, Stratos, & Bergen, 1992). The participants are asked to report on their baseline (pretest) behavior on the posttest. The retrospective pretest data are then compared with the posttest reports in the data analysis. With no client identifiers, the participants appear to be more willing to report negative health behaviors on a retrospective pretest and to be more honest about sensitive questions than the regular pretest. If clients underreport their negative health behaviors on the pretest but are more honest on the posttest, programs can appear to have negative

results when they actually had positive results. The major reason for using the retrospective "then-and-now" data collection strategy in the online/mailed survey is because there was no other way to estimate the participants' baseline behaviors, knowledge, and health beliefs.

Survey completion incentives. An incentive was offered to the participants to encourage participation in the research survey. Incentives included a free digital video disc created by Dr. Patty Trela, the program director, of materials covered in the Build-A-Bone Program (i.e., bone health, exercise, and nutrition). This incentive was valued at $39.99. The participants were instructed to fill out the receipt, which was attached to the end of the questionnaire, and return it to Robyn Hyatt (principal investigator) either by e-mail or U.S. mail (see Appendix H). The digital video disc was mailed to the participants at the close of data collection. Each participant was also entered into a drawing for a free weight vest (worth approximately $125.00) that was awarded at the close of the final data collection.

Research Design

The research design was a quasi-experimental 2 (repeated measures) X 2 (post hoc risk level) statistical control design involving two cohort subgroups and conducting analyses of outcomes over time of two groups to determine whether certain types of clients benefit more from the program (e.g., age, gender, ethnicity, education level, and level of risk at baseline according to the risk factors currently specified by the National Osteoporosis Foundation). The retrospective pretest/posttest study used a questionnaire containing subscale portions of standardized measures

designed to address the client dependent variables of interest in the study.

Measurement

Outcomes for this study were measured using components of standardized instruments commonly used in health research. Only subscale portions of the following standardized measures were used rather than the entire instrument in order to reduce participant testing burden. The measures were aggregated into a single testing battery and formatted for the "then-and-now" questionnaire. One hundred sixty questions were on the questionnaire, and it took approximately 20 to 25 minutes to complete.

Participant demographics. This portion of the questionnaire contained 18 questions and included those related to age, ethnicity, gender, education, length of time since attendance in the Build-A-Bone Program, reasons for enrollment, diagnosis of osteopenia or osteoporosis, and participation in other osteoporosis prevention programs.

Dual-energy x-ray absorptiometry scan data. The participants were asked to self-report their scan values before and after attending the Build-A-Bone Program. They were also asked to obtain these values from their doctor or medical records to improve accuracy if they did not have their own personal record of them.

Risk factors for osteoporosis. The National Osteoporosis Foundation (2008) identified risk factors for osteoporosis. Based on this list, 12 modifiable risk factors were formatted in box form. Participants were instructed to check the box next to the risk factors they had before enrolling in the Build-A-Bone Program. A similar box

assessed participant risk factors after participating in the Build-A-Bone Program.

Falls. The Elderly Falls Screening Test (Cwikel, Fried, Biderman, & Glinsky, 1998) was used to assess the participants' history of falls before and after participating in the Build-A-Bone Program. This five-item measure has been used as a fall-risk screening test for community-dwelling elderly individuals to divide them into high- and low-risk groups (Cwikel et al.). The measure was modified for applicability to this research by eliminating two questions related to participant observations and modifying the remaining questions to ask about fall experiences before and after the Build-A-Bone Program. Six questions (four dichotomous and two fill-in-the-blank) were asked of the participants.

Physical activity. An 18-item, modified version of the International Physical Activity Questionnaire (2002) was used in this study. Modifications included simplifying questions of vigorous and moderate activities and asking questions about weight-lifting activities. This questionnaire has been tested with adults aged 15 to 65 years old (Bauman et al., 2009; Hagströmer, Oja, & Sjostrom, 2006).

Balance. The Berg Balance Scale (Berg, Wood-Dauphinee, Williams, & Maki, 1992) was used to test the participants' balance before and after completing the Build-A-Bone Program. This scale has been widely used in research investigating fall prevention for older adults (Banez et al., 2008; Kenny et al., 2009; Sinaki & Lynn, 2002). The Berg Balance Scale has demonstrated high internal consistency (Cronbach alpha = 0.96; Berg et al.). Twenty-six rating scaled response questions were asked of each participant of experiences before and after the Build-A-Bone Program.

Nutrition and dietary patterns. Participants were asked questions with regard to calcium intake, vitamin D intake, caffeine and alcohol consumption, and nutritional habits with regard to sodium, protein, and wheat bran intake before and after completing the Build-A-Bone Program. Participants marked a yes/no response for 12 items for 24 responses.

Health beliefs. The Osteoporosis Health Belief Scale (Kim, Horan, Gendler, & Patel, 1991) is commonly used to measure health beliefs about osteoporosis (Burgener et al., 2005; Hsieh, Novielli, Diamond, & Cheruva, 2001; Shanthi, McLeod, Kennedy, & McLeod, 2008). The Osteoporosis Health Belief Scale consists of seven subscales, including perceived susceptibility, seriousness, benefits of exercise, benefits of calcium intake, barriers to exercise, barriers to calcium intake, and health motivation. Cronbach alpha internal consistency scores have been found to range from 0.71 to 0.82, which is in the range for an acceptable level of reliability for the instrument (Horan, Kim, Gendler, Froman, & Patel, 1998). Thirty balanced scaled response questions were used on the questionnaire.

Mini-Mental Screening Exam. The Mini-Mental Screening Exam (Folstein et al., 1975) is frequently used as a screening tool to assess cognitive abilities (Holsinger, Deveau, Boustani, & Williams, 2007; Tombaugh & McIntyre, 1992). Twelve questions were asked during the initial phone interview to assess the participants' cognitive abilities so as to screen out those who would be unable to participate in the study. The questions assess the participants' orientation, registration, attention/calculation, and recall.

Process Evaluation Measures

Client Satisfaction Questionnaire

The Client Satisfaction Questionnaire (Kumpfer, 2002) included 10 questions (3 fill-in-the-blank and 7 balanced-scaled responses) with regard to client satisfaction with the Build-A-Bone Program. Questions were asked with regard to participant referral to the program, personal knowledge/relationships with program staff, attendance, client interest in refresher classes, and individual perceptions about the program's contribution to overall health. Finally, participants were invited to make recommendations for improvement in the Build-A-Bone Program. This client satisfaction form has been used in previous evaluations of a drug abuse prevention program (Kumpfer). Because the Client Satisfaction Questionnaire is not a scale but client feedback, there are no psychometric measures for reliability or validity.

Data Analysis

Participants completed questionnaires using SurveyMonkey.com, a Web-based program that allows data collection by way of a Web site. Sixty-four participants completed the questionnaire online and 39 participants completed hard-copy questionnaires. Data from the hard-copy questionnaires were entered on the SurveyMonkey.com Web site. Data were downloaded from the Web site into Excel and then converted to SPSS for analysis. Participants who did not complete any of the scales that measure risk or the dependent variables were removed prior to analysis. All analyses were conducted using SPSS, Version 12, for Windows.

Analyses: Specific Aim 1, The Outcome Evaluation

The research design was a 2 (repeated measures) X 2 (post hoc risk level) analysis of variance. Research questions addressed both main effects for program outcomes (time) as well as interactions between time and risk. High- and low-risk groups were created by performing a mean split on the pretest number of risk factors. The research examined the following dependent variables:

1. Risk factors: Difference in number of risk factors BEFORE AND AFTER
2. Falls: Difference in number of falls BEFORE AND AFTER
3. Physical activity: Difference in number of days and time per week BEFORE AND AFTER (i.e., moderate, vigorous, walking, sitting, and weight lifting)
4. Balance: Difference in balance scores BEFORE AND AFTER
5. Nutrition and dietary patterns: Difference in dietary habits BEFORE AND AFTER
6. Personal health beliefs: Difference in health beliefs BEFORE AND AFTER.

Research Questions

1. Is there a reduction in the number of risk factors that participants report from pretest to posttest? This is an examination of analysis of variance main effects from pretest to posttest for number of risk factors.

2. Is there a reduction in falls from pretest to posttest? This is an examination of analysis of variance main effects from pretest to posttest for number of falls.

3. Do participants with a greater number of pretest risk factors improve more than those with fewer pretest risk factors? This is a 2 X 2 analysis of variance interaction between time (pretest to posttest change in independent variables) and risk level (determined post hoc by assigning participants to high- and low-risk groups based on a mean split on number of pretest risk factors).

4. Do those who attend all program sessions show greater improvement on the dependent variables than those who did not? This is an analysis of variance main effect for dosage (defined as a dichotomous variable comprised of those who completed all four program sessions compared with those who did not).

5. Do program participants who have been out of the program longer have better outcomes than those who completed the program more recently? This was addressed using regression analysis that used time since program completion as a predictor of pretest to posttest change scores (calculated by subtracting pretest scores from posttest scores).

6. Did the program influence the participant's health beliefs with regard to osteoporosis? This is an analysis of variance main effect for time (pretest to posttest change).

Effect sizes for analysis of variance were calculated using partial eta-squared from the SPSS analysis of variance.

Analyses: Specific Aim 2, The Process Evaluation

Research Questions

1. What are the correlates of high client satisfaction? To examine the relationship between satisfaction and other variables (e.g., recommendations for a refresher course, recommendations to the program, and satisfaction with program leader), several analyses were conducted. For dichotomous variables, I used a *t* test comparing two groups (e.g., males compared with females) on satisfaction scores. Pearson *r* correlations were conducted between satisfaction and continuous or categorical variables.
2. What are client recommendations for program improvement? The open-ended feedback section of participant recommendations for program improvement was summarized based on frequency of responses.

Sample power analyses. In order to estimate statistical power for analyses, I used the procedures described by Murray (1998) for group randomized trials and the effect-size criteria outlined by Cohen (1988). Cohen defined small, medium, and large effect sizes as group differences of .2, .5, and .8 standard deviation units, respectively. I proposed a sample size of between 100 and 150 participants for the intervention group, with a final sample of 103 individuals.

Completing a power analysis using an estimated power of .8 demonstrated that 26 participants were needed in each group in order to detect significant differences between groups for outcome variables with a large effect size, 64 in each group to detect a medium effect size, and 394 in each group to detect a small effect size. Hence, with an estimated 50 to 64 participants per two comparison groups, I needed to be able to detect significant differences at a p value of .05 for outcome variables with a medium effect size but not a small effect size.

Results

Participant Demographics

The participant base was 160 individuals. Of this base, 34 (31%) were unable to be contacted by telephone, e-mail, or U.S. mail and 23 (15%) declined the invitation to participate in the study. One hundred three questionnaires were attempted, with 83 questionnaires completed.

Of those completing the questionnaire, all participants reported English as the predominant language spoken in the home. Ethnicity of the participants included Caucasian (97.5%), Hispanic (1.2%), and Asian (1.2%). The participants included 93% females and 7% males, with ages ranging from 29 to 91 years old (8% ages 29 to 49, 38% ages 50 to 59, 36% ages 60 to 69, 15% ages 70 to 79, 1.5% ages 80 to 89, and 1.5% ages 90 to 99). Participants reported educational background of high school (17.1%), associate's degree (11%), bachelor's degree (36%), master's degree (28%), and doctorate/medical doctor/dentist (7.3%; see Table 3.1).

Table 3.1

Participant Demographics

Demographics	Number	Percent
Gender		
Female	76	93.0
Male	6	7.0
Age		
20 to 29	1	1.0
30 to 39	0	0.0
40 to 49	5	8.0
50 to 59	32	38.0
60 to 69	30	36.0
70 to 79	12	15.0
80 to 89	1	1.0
90 to 99	1	1.0
Mean = 61.28 years		
Ethnicity		
Caucasian	79	97.0
Hispanic	1	1.5
Asian	1	1.5
Education		
High school/general equivalency diploma	14	17.0
Associate's degree	9	11.0
Bachelor's degree	30	37.0
Master's degree	23	28.0
Doctorate/medical doctor/dentist	6	7.0

For 92% of the participants, the Build-A-Bone Program was their first experience with an osteoporosis prevention program. Fifty percent of the participants reported a previous diagnosis of osteoporosis, and 75% reported a previous diagnosis with osteopenia. The average time since participation in the Build-A-Bone Program was 19.4 months. Participants reported reasons for enrollment to improve health (33%), prevent osteoporosis (43%), reduce falls (2%), doctor's recommendation (6%), and other (16%). Eighty-six percent of the participants reported a dual-energy x-ray absorptiometry scan prior to the program, and 43% reported a scan after the program (see Table 3.2).

Table 3.2

Client Characteristics

Characteristics	Number	Percent
Previous diagnosis to:		
Osteoporosis	39	50.0
Osteopenia	56	75.0
First experience osteoporosis prevention program	73	92.0
Reasons for attending:		
Improve health	27	33.0
Prevent osteoporosis	35	43.0
Reduce falls	2	2.0
Doctor's recommendation	5	6.0
Other	13	15.0
Dual-energy x-ray absorptiometry scan:		
Before	68	86.0
After	34	43.0

Thirty-eight percent of the participants reported taking hormonal replacements before the program compared with 14% taking hormonal replacements after the program (see Table 3.3). This reduction is significant in the proportion of participants reporting hormone replacement therapy, $t(81) = 4.5$, $p < .05$ (see Table 3.3).

Primary Analyses for Outcomes

As stated in the Data Analysis section, the research design was a 2 (repeated measures) X 2 (post hoc risk level) analysis of variance. Research questions addressed both main effects for program outcomes (time) as well as interactions between time and risk. High- and low-risk groups were created by performing a mean split on the pretest number of risk factors.

Risk factors. A count of risk factors was computed for both pretests/posttests to determine if the participants experienced reduction in risk factors as a result of the Build-A-Bone Program. A significant reduction in the investigated 12 modifiable risk factors was found, with the participants reporting an average of one less risk factor

Table 3.3

Percentage of Participants Reporting Dual-Energy X-Ray Absorptiometry Scan and Hormone Replacement Therapy at Pretest and Posttest

Variable	Pretest	Posttest
Dual-energy x-ray absorptiometry scan	86.0%	43.0%
Hormone replacement therapy*	38.0%	14.0%

*Pretest compared with posttest difference significant at $p < .05$.

at posttest than they did at pretest (1.8 compared with 2.8), $F(1,85) = 64.95$, $p < .05$. The largest change was shown for the risk factor of sedentary lifestyle. Of the 28 women who reported a sedentary lifestyle at pretest, only 50% reported that risk factor at posttest.

Participants were then grouped into high- and low-risk categories based on the number of risk factors they had indicated at pretest. The low-risk group consisted of those who had indicated none, one, or two risk factors and comprised 39 people. The high-risk group consisted of those with three or more risk factors and comprised 47 people. The ratio of males and females in the two risk groups reflected what was found in the overall sample. The mean ages in the two groups were not significantly different (63 in the low-risk group compared with 60 in the high-risk group), $t(80) = 1.39$, $p > .05$.

One of the major hypotheses of the current study was that those with high risk would improve more than those with lower risk. In order to test this hypothesis, a series of 2 (pretest compared with posttest) X 2 (high risk compared with low risk) analyses of variance were performed for each of the dependent variables.

Falls. Analysis of falls showed a significant main effect for the Build-A-Bone Program overall but not for levels of risk. Both the proportion of people who reported a fall and the number of falls were significantly lower at posttest than at pretest. Overall, 36% of those at pretest reported any fall and only 22% reported a fall at posttest, $F(1,75) = 40.0$, $p < .001$. In addition, the number of falls was .75 at pretest and only .30 at posttest, $F(1,75) = 13.9$, $p < .001$ (see Table 3.4). No

Table 3.4

Percentage of Participants Reporting a Fall or a Fall Injury at Pretest and Posttest

Variable	Pretest	Posttest
Any fall*	36.0%	22.0%
Injury from fall	25.0%	21.0%

*Pretest compared with posttest difference significant at $p < .05$.

significant difference was found in the proportion of people who reported an injury as a result of a fall from pretest to posttest (25% compared with 21%), $F(1,75) = 1.2$, $p > .05$ (see Table 3.4). No significant overall effects for risk or interactions between risk and within-subjects effects (all Fs < 1) were found.

Physical activity. Participants were asked about physical activity behaviors of walking, moderate exercise, vigorous exercise, and weight training. Participants were asked to indicate the number days per week they did each type of exercise and the number of hours and minutes per day. The reported amounts were converted into minutes per week for the analysis.

Results of the analysis showed significant increases for several physical activities from pretest to posttest. A significant increase was found in number of days per week that the participants engaged in moderate exercise (2.7 compared with 3.3), $F(1,79) = 7.8$, $p < .05$; vigorous exercise (2.0 compared with 2.7), $F(1,71) = 13.37$, $p < .01$; and weight training (.90 compared with 1.9), $F(1,79) = 18.9$, $p < .01$. No significant change was found for number of days walking (4.5 compared with 5.0), $F(1,78) = 2.6$, $p > .05$ (see Table 3.5).

Table 3.5

Days Per Week of Various Activities Reported at Pretest and Posttest

Variable	Days per week pretest	Days per week posttest
Walking	4.50	5.00
Moderate exercise therapy*	2.70	3.30
Vigorous exercise*	2.00	2.70
Weight training*	.90	1.90

*Pretest compared with posttest difference significant at $p < .05$.

There was also a main effect for risk on the number of days of vigorous activity with those in the low-risk group reporting significantly more days of this type of exercise than those in the high-risk group (3.0 compared with 1.6), $F(1,71) = 9.8$, $p < .01$. None of the interactions of time and risk was significant for any of these variables.

In addition to the number of days of exercise per week, participants were also asked to indicate the amount of time they spent exercising each day. For each participant, number of days was multiplied by the number of minutes per day in order to compute total minutes per week that was then divided by the number of days. This computed average minutes per day, which was used as the dependent variable. Analysis of variance showed one significant main effect. There was a significant increase in the average minutes per day of vigorous activity from pretest to posttest (46 compared with 63), $F(1, 34) = 4.2$, $p < .05$. There were no significant main effects for risk and no significant interactions.

Balance. Balance was measured using the Berg Balance Scale, which is a standardized measure. There were no significant main effects or interactions for the Berg Balance Scale. Pretest scores were identical to posttest scores across all participants. Participant scores on balance were significantly and negatively correlated with age ($r = -.41$, $p < .05$). This finding indicates that older women have lower scores on the Berg Balance Scale than younger women.

Nutrition and dietary patterns. Nutrition and diet were measured using a 12-item scale on which participants indicated whether they regularly engaged in specific positive eating behaviors (e.g., taking a calcium or vitamin D supplement and limited alcohol and caffeine). These items were summed for a total score and used as the dependent variable. Significant main effects for both time and risk factors were found. There was also a significant interaction between time and risk factors, $F(1,69) = 7.8$, $p < .01$. Post hoc t tests were performed to examine the interaction. Those in the high-risk group had significantly lower nutrition scores at pretest than those in the low-risk group (5.6 compared with 7.5), $t(74) = 3.56$, $p < .05$. However, at posttest, this difference was not significant (9.0 compared with 9.4), $t(73) = .79$, $p > .05$. Hence, both high- and low-risk groups improved from pretest to posttest, but the high-risk group showed greater improvement overall (see Figure 3.1).

Osteoporosis Health Belief Scale. The Osteoporosis Health Belief Scale was broken into the following four subscales: (a) negative consequences of osteoporosis (e.g., "It would be very serious if you got osteoporosis"), (b) beliefs about strong bones (e.g., "Regular exercise helps to build strong bones"), (c) aversion to healthy

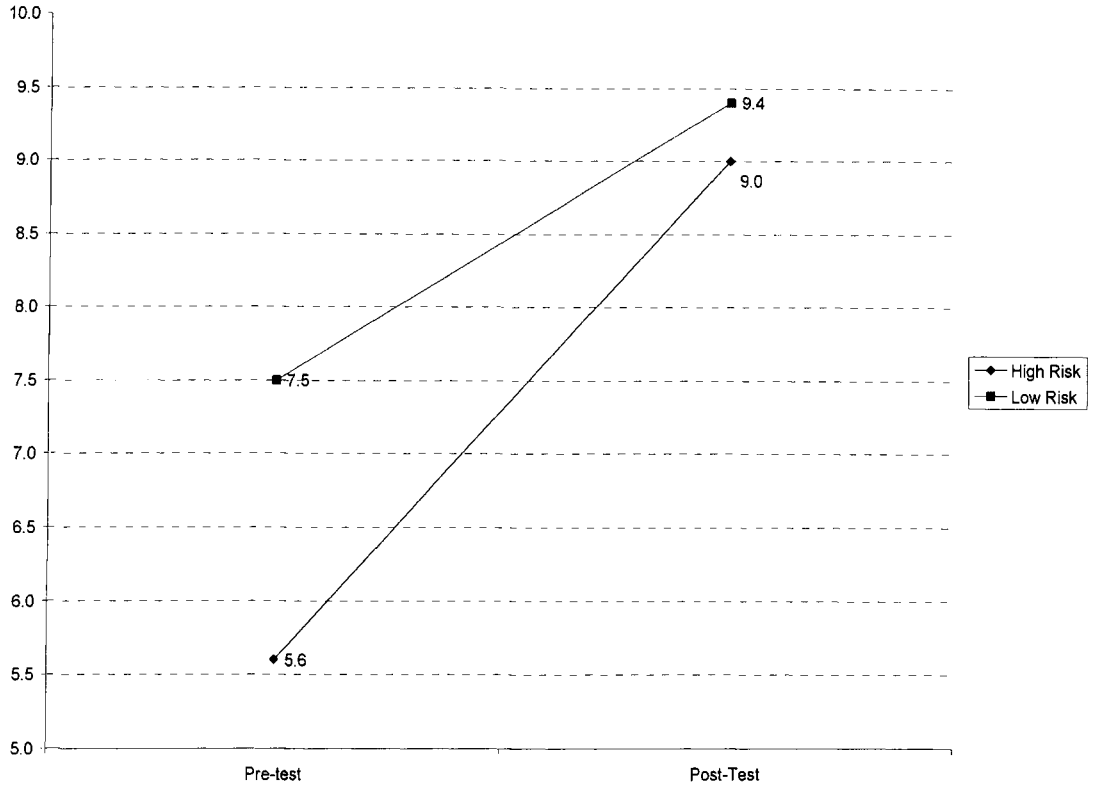

Figure 3.1. Nutrition and diet scores for high- and low-osteoporosis-risk participants at pretest to posttest.

*Interaction significant at $p < .05$.

behaviors (e.g., "Exercising regularly makes you uncomfortable"), and (d) health priorities (e.g., "Keeping healthy is very important for you"). Analyses showed significant main effects for time on all four of the subscales of the Osteoporosis Health Belief Scale. At posttest, participants had significantly higher negative beliefs about osteoporosis, $F(1,78) = 36.6$, $p < .05$, significantly higher beliefs about strong bones scores, $F(1,79) = 32.1$, $p < .05$, significantly lower aversion to health behavior scores, $F(1,76) = 5.3$, $p < .05$, and significantly higher health priority scores, $F(1,71) = 12.1$, $p < .05$. There was only one significant main effect for risk:

aversion to healthy behavior scores, which were significantly higher among the high-risk group than the low-risk group, $F(1,76) = 13.6$, $p < .05$. There were no significant interactions between time and risk for any of the Osteoporosis Health Belief Scale subscale scores.

Effect Size

Table 3.6 shows small, medium, and large effect sizes. Generally, large and medium effect sizes were significant whereas small effect sizes were not significant. This study demonstrates adequate power to detect large and medium effect sizes.

Secondary Analysis of Dosage Effects

Analyses were conducted to determine whether dosage was related to outcomes. For these analyses, the sample was split into groups by whether the participant completed all four sessions of the Build-A-Bone Program. Seventy-five participants completed all sessions and the remaining 11 completed one to three sessions. Dosage was not related to any of the examined posttest outcome variables (i.e., falls, minutes of activity per week, Osteoporosis Health Belief Scale, Berg Balance Scale, diet, or any of the satisfaction measures). The null results are not surprising given the small variability in the dosage variable. Of the 11 participants in the low dosage group, 9 completed three out of four sessions.

Secondary Analysis of Client Satisfaction Effects

A set of correlations were performed between the overall satisfaction measure and posttest measures to determine whether satisfaction was related to program

Table 3.6

Effect Sizes (Partial Eta Squared) for Time Main Effects, Risk Factor Main Effects, and Time X Risk Factor Interactions on Study Dependent Variables

Dependent variable	Time	Risk factors	Interaction
Moderate exercise days per week	.090	.042	.035
Vigorous exercise days per week	.158	.122	.000
Walking days per week	.032	.031	.301
Weight training days per week	.193	.035	.006
Average minutes per day moderate exercise	.111	.064	.032
Average minutes per day vigorous exercise	.026	.003	.017
Average minutes per day walking	.012	.019	.000
Average minutes per day weight training	.133	.016	.022
Nutrition	.573	.092	.102
Negative consequences of osteoporosis	.319	.013	.048
Beliefs about strong bones	.289	.000	.015
Aversion to healthy behaviors	.066	.152	.002
Health priorities	.146	.010	.001
Number of falls	.157	.000	.000
Berg Balance Scale	.031	.003	.005

Note. Partial eta squared is the ratio of variance accounted for by an effect and that effect plus its associated error variance within an analysis of variance study. Larger values of partial eta squared indicate a higher proportion of variance accounted for by the independent variable.

outcomes. Satisfaction was not related to any of the outcome variables examined. These posttest variables were falls, Berg Balance Scale scores, number of risk factors, nutrition and diet, minutes of activity per week, and Osteoporosis Health Belief Scale scores. In addition, satisfaction was not related to dosage or the number of sessions completed. Overall, satisfaction scores were quite high, which could have led to a ceiling effect, which may explain the null results.

Secondary Analysis of Effects of Time Since Program Completion

Participants indicated the month and year in which they participated in the Build-A-Bone Program. From these numbers, I calculated the length of time since program completion. Participants indicated that they had completed the program between 2 and 31 months previously, with an average of 19.5 months. Two comparison groups were created by a mean split on time since program completion. Analyses of variance were calculated to determine whether time since program completion had any effect on the number of risk factors or on the dependent variables. No significant main effects or interactions were found by this analysis.

Correlates of Client Satisfaction

In order to determine the reasons for client satisfaction, a number of correlations were performed using Pearson *r*. Satisfaction measures were highly intercorrelated (see Table 3.7). All correlations are significant at the .01 level (see Table 3.7). Satisfaction with the program was not correlated with the number of sessions attended or with how well the participants knew the program staff prior to

Table 3.7

Correlations of Overall Satisfaction With the Build-A-Bone Program

Variable	Correlation with satisfaction
Would like to come back for a refresher	.28
Would recommend the program	.62
Was helped by the program	.40
Satisfaction with program leader	.60
Health improvement	.37

attending the Build-A-Bone Program.

Correlations between satisfaction and demographic measures were also examined. Overall satisfaction with the program was not correlated with age, number of risk factors, or number of falls. Age was significantly correlated with the rating of the program leader, $r = .25$, $p < .05$. The number of reported falls at pretest was significantly correlated with the participants' desire to return for a refresher class, $r = .24$, $p < .05$ as well as with how much the participants believed the program improved their health, $r = .24$, $p < .05$. Finally, the number of pretest risk factors was significantly correlated with whether the participants would recommend the program to others, $r = .24$, $p < .05$.

Recommendations for Program Improvement

Participants in the Build-A-Bone Program provided narrative recommendations for program improvement. The responses were provided in answer to the following open-ended question: What are your recommendations for Build-A-Bone Program

improvement? Sixty-three participants entered free-text responses, with 17% of those respondents mentioning lack of follow-through and motivation to maintain behavior change and 22% suggesting learning reinforcement with provision of a follow-up program (i.e., refresher courses). Participants (4%) also commented that the digital video disc incentive, which was provided for participation in this study, acted as a reminder and reinforcement to resume previously learned osteoporosis prevention behaviors.

Additional comments included requests for extra weight-lifting/exercise courses incorporated into the program and weekly exercise classes after the program, additional locations for the program, and increased advertising to reach at-risk populations—including young women and men. The suggestions were consistent with other studies investigating process evaluations and osteoporosis prevention (Curry, Hogstel, Davis, & Frable, 2002; Gold & Silverman, 2004; Turner, Gray, Hunt, & Jones, 2004).

Study Limitations

The foremost limitation of this study is the lack of a true experimental, randomized, control design that controls for all threats to internal validity of the results. Other researchers have noted similar limitations with the inability to determine actual effectiveness and impact of a program without a randomized control group (Davis, White, & Yang, 2006; Pearson, Burkhart, Pifalo, Pallago-Toy, & Krohn, 2005).

The rigor of a research study is the ability to measure what actually happened during the study; interval validity of a study must be addressed (Valente, 2002). Whereas use of the quasi-experimental ex post facto design does not control for selection bias, statistical regression to the mean, and selection maturation, other threats were greatly reduced, including history, maturation, testing instrumentation, placebo, diffusion, Hawthorne effect, location, and implementation.

Participants in the Build-A-Bone Program included in this study were primarily educated, postmenopausal, Caucasian women between the ages of 50 and 80 who displayed self-motivation for behavior/lifestyle change and who voluntarily participated in the program. Other studies have reported investigations of similar populations (Francis, Matthews, Van Meechelen, Bennell, & Osborne, 2009; Jamal et al., 1999; Pearson et al., 2005). Because of the highly motivated and nearly homogeneous sample as well as external validity or generalization of the results to populations of differing ethnicities, men and younger populations may be questioned.

Other limitations with regard to generalizability of the results include interaction of setting/treatment and history/treatment. This study was conducted in Salt Lake City, Utah, during summer 2009 with participants who attended the Build-A-Bone Program in Salt Lake City from 2007 to 2009. These threats would have to be tested in future replication studies in different settings and in different time periods.

The retrospective "then-and-now" predesign/postdesign has limitations, including data collection only on participants who complete the testing batteries and

not from the entire group of program participants. This leads to the assessment of participants who complete the program and the inability to examine information from participants lost to attrition. Further limitations include possible memory deficits of the participants and the inability to substantiate the findings of the "then-and-now" data due to a lack of prospective traditional pretesting/posttesting data.

Additional limitations relate to the lack of standardized measurement instruments that are necessary to compare outcomes of different studies exploring osteoporosis prevention. This observation was also noted by Werner (2005) in a comprehensive review of osteoporosis assessment, correlates, and outcomes. Although subscale components from standardized instruments were utilized in this study, difficulties were encountered with an inability to compare outcomes with other studies of similar interest.

Discussion and Conclusions

The results of this program evaluation are positive and suggest that an experiential skills training program for osteoporosis prevention can reduce risk factors and, most importantly, reduce the most dangerous problem of osteoporosis, namely, falls. Participants reported that their rate of falls had decreased by 50% from prior to the program. On the International Physical Activity Questionnaire, they had significantly increased their physical activity, including more weight training. The participants' composite modifiable risk factors also decreased significantly. The analysis of correlates or associated factors to client improvement suggested that clients who were higher risk or younger had larger behavioral improvements or reductions in

risk. No negative results were found in the program.

The results of this retrospective pilot study suggest that a prospective evaluation of the Build-A-Bone Program is warranted. It is hoped that these results can be used to attract additional funding for the program and dissemination of the results to other programs and clinics. In addition, the results of this study suggest that a large percentage of prior participants in the program would be willing to complete an online or mailed survey to evaluate the program. In this case, the incentive of the digital video disc and weight vest matched well the recommendation for improvement, namely, a way to reinforce or refresh their osteoporosis prevention knowledge and behaviors learned through the Build-A-Bone Program at home.

The major limitations of this study relate to it being a retrospective survey that brings concerns with memory. The clients were rating their current behaviors, and they were not likely to have been engaging in the Build-A-Bone Program activities prior to this program. However, having a prospective study with a randomized control group would help determine whether the knowledge about dual-energy x-ray absorptiometry scan scores and having either osteoporosis or osteopenia would have created a similar positive behavior change. A more complete study would have also had a "treatment-as-usual" condition that would determine the amount of behavior change in improved weight training, physical activity, and nutrition; hormone replacement therapy would have occurred just with increased knowledge of the activities that would help build their bones and prevent falls or bone breakage in the future.

Recommendations for future research include investigation of the impact of the osteoporosis prevention programs on bone density with actual laboratory data and the contribution of medication on increased bone density and fracture reduction.

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CHAPTER 4

PROCESS EVALUATION AND THE BUILD-A-BONE OSTEOPOROSIS PREVENTION PROGRAM

Background and Significance

Osteoporosis is the most commonly occurring bone disease and affects approximately 55% of the population over 50 years old (National Osteoporosis Foundation, 2008). It is often referred to as the "silent" disease because the disease often is not apparent until fractures occur. The National Osteoporosis Foundation estimates that in the United States 10 million Americans already have osteoporosis and another 34 million have low bone mass putting them at risk for osteoporosis. Women are four times more likely to get osteoporosis than men (National Osteoporosis Foundation).

Osteoporosis is a debilitating disease that can strike at any age with physical, psychological, and social consequences, including pain, loss of mobility, loss of independence, decrease in quality of life, interference with activities of daily living, and interference with familial relationships (Meadows & Mrkonjic, 2003; Roberto, 2004). Fear, depression, and anxiety are often reported in women with osteoporosis (Lydick, Martin, & Yawn, 1996; Silverman, Shen, Minshall, Xie, & Moses, 2007). Moreover, osteoporosis-related fractures account for direct medical expenses (e.g., hospitals, nursing homes, and outpatient services) of an estimated $19 billion. By

2025, experts predict these costs to reach $25.3 billion (National Osteoporosis Foundation, 2008).

Osteoporosis is preventable and treatable. Health promotion and education interventions are valuable to disease prevention and management with the potential to increase knowledge and change behaviors. Unfortunately, few osteoporosis prevention programs have been studied that provide insight into knowledge and behavior that will help reverse the trajectory of this disease.

Background and Rationale

According to a search of the research literature, there are few osteoporosis prevention programs in the United States. Further, research is limited with regard to osteoporosis prevention programs, with most studies focusing on outcome evaluation data rather than process evaluation, data which is needed to establish the evidence base for effective program implementation.

The Build-A-Bone Osteoporosis Prevention Program (hereafter referred to as Build-A-Bone Program) is a brief community outreach program designed to provide education and skills training related to osteoporosis prevention. The program was developed in 2005 at the University of Utah Orthopedic Center in Salt Lake City, Utah. Participants learn how to care for and strengthen their bones in order to optimize bone health, prevent osteoporosis, and reduce falls and risk of fractures. Despite having 200 to 250 prior participants, the Build-A-Bone Program has never been evaluated for client satisfaction, correlates of high client satisfaction compared with clients with low client satisfaction, and recommendations for program

improvement. The purpose of this chapter is to discuss process evaluation research with respect to the Build-A-Bone Program. This investigation provides an important contribution for program improvements, looks at future research funding, and disseminates results to other programs and clinics.

Process Evaluation

Process evaluations primarily document whether the program was implemented as planned and how to improve the implementation of the program to improve results. The process evaluation measures what actions or events were implemented with different types of clients. The process evaluation is needed in order to understand the dependent variables or the outcomes of the intervention. Even though outcome evaluation research is crucial to successful health promotion and education interventions to determine whether interventions have had the intended impact, the degree of impact, and have been effective, a process evaluation is necessary to document how the effectiveness was achieved (Valente, 2002). Results can be used to help document program implementation, program improvements, potential research funding, and dissemination of results to other programs and clinics. Process evaluation research can answer questions that include the following:

1. Was the program implemented as planned?
2. What are the types of clients to participate?
3. What are the correlates of high client satisfaction compared with clients with low client satisfaction?
4. Does the program match the needs of the participants?

5. What are some ways to improve the program?

Process Evaluations of Osteoporosis Prevention Programs

Process evaluation research that pertains to community outreach osteoporosis prevention programs is limited. Only three studies could be located in which process evaluations had been conducted and reported (Curry, Hogstel, Davis, & Frable, 2002; Gold & Silverman, 2004; Turner, Gray, Hunt, & Jones, 2004). The researchers examined interventions that utilized a program design of short educational programs to multicomponent, experiential skills training with four to five classes over approximately 2 months. Program content included screenings, lecture presentations, consultations, and group exercises over time periods of one session lasting from 30 minutes to 15 hours over a 5- to 10-week period. Results of each of these studies suggest high client satisfaction with the respective program format, course content, and length of the interventions despite the variability in program delivery and implementation. Suggestions for program improvement included provision of a follow-up program, nutritional counseling, and additional demonstrations of exercises. Although these studies provide valuable information, little is known with regard to the type of process evaluation conducted (e.g., fidelity and checklist) or recommendations for program improvement.

The Build-A-Bone Osteoporosis Prevention Program: Program Description

The Build-A-Bone Program is a community outreach multicomponent, experiential, educational intervention. The Build-A-Bone Program was developed by

Patty Trela, PT, DPT, CMPT, in October 2005 at the University of Utah Orthopedic Center in Salt Lake City, Utah. It is an innovative and unique program that is designed to educate participants about how to care for and strengthen their bones in order to optimize bone health, prevent osteoporosis, and reduce falls and risk of fractures. In addition, the program is designed to provide interactive, experiential learning with regard to walking, balance, weight lifting, and core strength.

The Build-A-Bone Program is a four-class series of 2-hour sessions that are usually held on Tuesday and Saturday on consecutive weeks within a calendar month eight to nine times each year. This format was selected to minimize information overload in a session and to provide weekly variety with exercises and didactic material. Participants live in residential settings with ages ranging from 20 to 80 years old. The cost of the program is $125.00, which includes a pedometer and weekly handouts.

Classes are held at the University of Utah Orthopedic Center with class sizes of 10 to 15 participants. Classes are taught by University of Utah Orthopedic Center staff members who are experts in bone health, including physical therapists, dieticians, and nurse practitioners. The program director trains and supervises the instructors to assure the curriculum is followed and the program is implemented as planned. Topics include bone health and related medications, walking, balance, weight lifting, posture/core strength, and nutrition. Behavior change is discussed in each class and feedback is provided for correct exercise technique and is modified for individual circumstances. Homework assignments include recording steps with a

pedometer and the challenge to increase steps by 20% each week until the goal for the number of steps each day is met.

The Build-A-Bone Osteoporosis Prevention Program Curriculum

Following is a description of the Build-A-Bone Program curriculum:

1. Week 1: exercise and bone health (i.e., normal bone, osteopenia, osteoporosis, and research on exercise) and posture and body mechanics (i.e., spine alignment, posture [sit/stand, posture during functional activities, and posture], and exercise)
2. Week 2: walking (i.e., benefits, techniques, 10,000 steps, shoes, and intensity) and balance (i.e., proprioception, vision, ear, balance exercises, and flexibility for legs)
3. Week 3: medical (i.e., fracture risk, medications to treat osteoporosis, and a dual-energy x-ray absorptiometry scan) and weight lifting (i.e., isotonic exercise for arms and legs)
4. Week 4: core strength (i.e., back extension exercises and abdominal exercises without spine flexion) and nutrition (i.e., all foods and vitamins beneficial and detrimental to bone).

Despite the benefits of the Build-A-Bone Program by increasing knowledge of osteoporosis and providing experiential experiences, the program has never been investigated for correlates of high client satisfaction compared with clients with low client satisfaction and recommendations for program improvement. This investigation

provides an important contribution for program improvements, looks at future research funding, and disseminates results to other programs and clinics.

Research Aim and Research Questions

Research Aim

The research aim is to conduct a process evaluation by collecting data reflecting participant demographic information, client satisfaction, and recommendations for program improvement.

Research Questions

The following research questions guided the data analysis:

1. What are the correlates of high client satisfaction?
2. What was the overall level of client satisfaction with the program?
3. What was the average attendance in the program?
4. What are the demographics/characteristics of the participants who attended the program?
5. What were client recommendations for program improvement?

Research Methodology

Study Participants

Participants recruited for this study included all 160 individuals enrolled in the Build-A-Bone Program between January 2007 and April 2009. Records of the clients' home and e-mail addresses had been kept by the program staff since January 2007. Participants were 98% Caucasian, approximately 7% males and 93% females, and

ages ranging from 29 to 91 years old. One hundred three participants or 64% of the 160 possible participants completed the questionnaire.

The *inclusion* criteria included all participants over the 2.5 years of the program who attended the Build-A-Bone Program for whom I had valid contact information: those who voluntarily signed the Institutional Review Board consent forms giving consent to participate in the research and those who demonstrated sufficient cognitive ability to accurately respond to the questions in the questionnaire. Whereas electronic and hard copies of the questionnaires were provided, computer competency was not required to participate.

The *exclusion* criteria included all participants who had developed mental disabilities (e.g., stroke, Alzheimer's disease, and mental disorder) that would limit their cognitive ability to complete the questionnaire.

Research Design

The research design was a quasi-experimental 2 (repeated measure) X 2 (post hoc risk level) design. The outcome variables for this section were client satisfaction with the Build-A-Bone Program and dosage (number of sessions completed). Results from the analysis of risk factor reduction and behavior change are reported in Chapter 3 of this dissertation.

Measurement

Participant demographics were investigated with 18 questions (10 fill-in-the-blank and 8 dichotomous) on the testing battery. Questions included those related to

age, ethnicity, gender, education, length of time since attendance in the Build-A-Bone Program, reasons for enrollment, diagnosis of osteopenia or osteoporosis, and participation in other osteoporosis prevention programs.

Client satisfaction for this study was measured using components of a standardized instrument commonly used in health research (Kumpfer, 2002). The assessment included 10 questions (3 fill-in-the-blank and 7 balanced-scaled responses) with regard to client satisfaction of the Build-A-Bone Program. Questions were asked with regard to participant referral to the program, personal knowledge/relationships with program staff, attendance, and client satisfaction with interest in refresher classes and individual perceptions of the program's contribution to improvement of overall health. Finally, the questionnaire included an open-ended item with regard to participant recommendations for improvement in the Build-A-Bone Program.

Study Procedures

Institutional Review Board approval for this study was obtained on June 10, 2009. After approval, the Build-A-Bone Program participant registration records were obtained from the University of Utah Orthopedic Center files. The records had been kept by the Build-A-Bone Program staff and included participant's name; address; phone; e-mail; and consent to be contacted with authorization for photograph, film, or interview. Each participant was initially contacted by way of an introduction letter or e-mail based on the availability of information provided at the time of registration in the Build-A-Bone Program (see Appendix A). The participants were then contacted by telephone and were provided information with regard to the purpose of the study and

an invitation to participate (see Appendix B). If potential participants accepted, the Mini-Mental Screening Exam (Folstein, Folstein, & McHugh, 1975) was then administered to assess the participant's cognitive abilities to accurately respond to the questions in the questionnaire. No participants were excluded from the study based on the Mini-Mental Screening Exam.

The Institutional Research Board approved questionnaire (see Appendix C) was pilot tested with seven women ages 24 to 57 prior to distribution. The purpose of the pilot test was to determine ease of access to the questionnaire through Surveymonkey.com, length of time to complete the questionnaire, and clarity of the questions. As the principal investigator for this study, I evaluated the results of the pilot test and determined that the projected length of time to complete the questionnaire was accurate and that the questions were clear and concise. The questionnaire required minimal grammatical and editing corrections before distribution to the participants.

Data Collection Methods

The study participants accessed the questionnaire by way of an electronic link attached to an e-mail (see Appendix D). For those participants who did not have computer access, a hard copy of the questionnaire was sent through U.S. mail with a return, postage-paid envelope. Instructions of study procedures were given to the participants in a cover letter and on the consent page of the questionnaire (see Appendix E and Appendix F). The participants were given 14 days to complete the questionnaire. After 3 weeks, reminder e-mails, phone calls, or both were initiated to

the participants who had not completed or returned the questionnaire (see Appendix G).

Human subjects' rights were protected by having each participant read and electronically sign the informed consent prior to completing the online survey. The informed consent was placed at the end of the cover letter that was attached to the questionnaire (see Appendix E and Appendix F). The participants were given the following direction: "Clicking below indicates that I have read the description of the study and I agree to participate." Participants receiving the mailed questionnaire were instructed that by returning the questionnaire they had read the description of the study and agreed to participate.

SurveyMonkey.com was used to collect data and to manage communication between the participant and the Web server, between the researcher and the Web server, and between the researcher and the participant. Because transfer of information across the Internet is not secure and could be observed by a third party, Secure Sockets Layer protocol was used and an explanation of the technology was provided to the participants during the initial phone contact and questionnaire cover letters. All participants were cautioned with regard to Internet use practices that may put them at risk such as using public computers or failing to close their browsers after completing the questionnaire.

Retrospective Data Collection

Because only retrospective data could be collected on former program graduates, this study relied primarily on utilizing a "then-and-now" data collection

procedure. This type of data collection procedure has been effectively used in public health studies, particularly with sensitive data such as child abuse or drug use (Rhodes & Jason, 1987) and family intervention programs (Pratt, McGuigan, & Katzev, 2000). The participants are asked to report on their baseline (pretest) behavior on the posttest. The retrospective pretest data are then compared with the posttest reports in the data analysis. This testing method has been successfully used in other studies investigating nutrition and program evaluation (Raidl et al., 2004; Skeff, Stratos, & Bergen, 1992). With no client identifiers, the participants appear to be more willing to report negative health behaviors on a retrospective pretest and to be more honest about sensitive questions than the regular pretest. If clients underreport their negative health behaviors on the pretest but are more honest on the posttest, programs can appear to have negative results when they actually had positive results. The major reason for using the retrospective "then-and-now" data collection strategy in the online/mailed survey is because there was no other way to estimate the participants' baseline behaviors, knowledge, and health beliefs.

Survey Completion Incentives

An incentive was offered to the participants in order to encourage participation in the research survey. Incentives included a free digital video disc created by Dr. Patty Trela, the program director, of materials covered in the Build-A-Bone Program (e.g., bone health, exercise, and nutrition). This incentive was valued at $39.99. The participants were instructed to fill out the receipt that was attached to the end of the questionnaire and return it to Robyn Hyatt (principal investigator) either by e-mail or

by U.S. mail (see Appendix H). The digital video disc was mailed to the participants at the close of data collection. Each participant was also entered into a drawing for a free weight vest (worth approximately $125.00) that was awarded at the close of the final data collection.

Data Analysis

Research Questions

1. What are the correlates of high client satisfaction? To examine the relationship between satisfaction and other variables (e.g., recommendations for a refresher course, recommendations to the program, and satisfaction with program leader), several analyses were conducted. For dichotomous variables, I used a *t* test comparing two groups (e.g., males and females) on satisfaction scores. Pearson *r* correlations were conducted between satisfaction and continuous or categorical variables.
2. What was the overall level of client satisfaction with the program? Descriptive statistics, including frequencies, were used to analyze these data.
3. What was the average attendance in the program? A mean score of sessions attended was calculated.
4. What are the demographics/characteristics of the participants who attended the program? Descriptive statistics, including frequencies, were used to analyze these data.

5. What were client recommendations for program improvement? The open-ended feedback section of participant recommendations for program improvement was summarized.

Results

The participant base was 160 individuals. Of these individuals, 34 (31%) did not respond to requests by telephone, e-mail, or U.S. mail and an additional 24 (15%) declined the invitation to participate in the study. Eighty-six participants answered questions about their experiences with the Build-A-Bone Program.

Demographics

All participants reported English as the language spoken in the home. Ethnicity of the participants included Caucasian (97.5%), Hispanic (1.2%), and Asian (1.2%). The participants included 93% females and 7% males, with ages ranging from 29 to 91 years old (mean = 61.28; see Table 4.1). For 92% of the participants, the Build-A-Bone Program was their first experience participating in an osteoporosis prevention program. Fifty percent of the participants reported a previous diagnosis of osteoporosis and 75% reported a previous diagnosis of osteopenia. Participants reported educational background of high school (17%), associate's degree (11%), bachelor's degree (37%), master's degree (28%), and doctorate/medical doctor/dentist (7.3%). The average time since participation in the Build-A-Bone Program was 19.4 months. Participants reported reasons for enrollment to improve health (33%), prevent osteoporosis (43%), reduce falls (2%), doctor's recommendation (6%), and other

Table 4.1

Participant Demographics

Demographics	Number	Percent
Gender		
Female	76	93.0
Male	6	7.0
Age		
20 to 29	1	1.0
30 to 39	0	0.0
40 to 49	5	8.0
50 to 59	32	38.0
60 to 69	30	36.0
70 to 79	12	15.0
80 to 89	1	1.0
90 to 99	1	1.0
Mean = 61.28 years		
Ethnicity		
Caucasian	79	97.0
Hispanic	1	1.5
Asian	1	1.5
Education		
High school/general equivalency diploma	14	17.0
Associate's degree	9	11.0
Bachelor's degree	30	37.0
Master's degree	23	28.0
Doctorate/medical doctor/dentist	6	7.0

(16%). Participants reporting a dual-energy x-ray absorptiometry scan prior to the program were 86% compared with 43% reporting a scan after the program. Thirty-eight percent of the participants reported taking hormonal replacements before the program compared with 14% taking hormonal replacements after the program (see Table 4.2).

Reasons for Attending the Program

Participants were asked to indicate the most important reason they enrolled in the Build-A-Bone Program. The majority (43%) said it was to prevent osteoporosis and an additional 33% stated it was to improve their health. Additional reasons included other (15%), a doctor's recommendation (6%), and to reduce falls (2%). Those who wrote in a free-text response to other mentioned "improving existing osteoporosis" or to "find out more about the disease" (see Table 4.2).

Referrals to the Program

Participants were asked where they learned about the Build-A-Bone Program. A flyer was the most frequently cited source of information, with 28% selecting "yes" for this option. The next most frequent sources were a "friend" (14%), a "doctor" (11%), and a "family member" (9%). Learning about the program from a staff member (5%) or a physical therapist (6%) made up the remainder of the responses. In addition, 37% selected other as their source of information. Of those who entered a free-text response, 50% indicated that they read about the program in an article published in *The Salt Lake Tribune* newspaper dated January 2, 2007 (see

Table 4.2

Client Characteristics

Characteristics	Number	Percent
Previous diagnosis to:		
Osteoporosis	39	50.0
Osteopenia	56	75.0
First experience osteoporosis prevention program	73	92.0
Reasons for attending:		
Improve health	27	33.0
Prevent osteoporosis	35	43.0
Reduce falls	2	2.0
Doctor's recommendation	5	6.0
Other	13	15.0
Dual-energy x-ray absorptiometry scan:		
Before	68	86.0
After	34	43.0
Hormonal replacement therapy:		
Before	31	38.0
After	11	14.0

Table 4.3).

Dosage

Adherence to the program was high. Participant attendance was reported as 98% attending three to four sessions. Eighty-seven percent attended all four sessions, 11% attended three sessions, 1.5% attended two sessions, and 1.5% attended one session (see Table 4.3).

Program Satisfaction

Participants indicated a very high level of satisfaction with the Build-A-Bone Program. Fifty-two percent reported that they were *very well satisfied* with the program, 31% were *well satisfied*, 5% were *somewhat satisfied*, and 2% were *very little satisfied* (see Table 4.3).

Satisfaction With Program Leader and Staff

Ninety-six percent reported being *very well satisfied* (73%) or *well satisfied* (23%) with the program leader, with only 5% *somewhat satisfied* with the program leader. The vast majority of the participants (88%) indicated that they did not know the program staff prior to enrolling in the Build-A-Bone Program (see Table 4.3).

Program Contribution

Fifty-eight percent of the participants indicated that the program helped them *a lot*, with an additional 42% indicating that the program helped them *somewhat satisfied*. When asked how much the program had improved their health, 51% said *a*

Table 4.3

Participant Comments About the Program

Comments	Number	Percent
Referrals to the program		
Flyer or poster	24	28.0
Friend	12	14.0
Doctor	9	11.0
Family member	8	9.0
Physical therapist	5	6.0
Staff member	4	5.0
Other	32	37.0
Dosage/attendance		
Session 4	75	87.0
Session 3	9	11.0
Session 2	1	1.0
Session 1	1	1.0
Mean = 3.8 sessions		
Program satisfaction		
Very little satisfied	1	1.0
Somewhat satisfied	4	5.0
Well satisfied	27	34.0
Very well satisfied	48	60.0
Satisfaction with program leader		
Somewhat satisfied	4	5.0
Well satisfied	18	22.0
Very well satisfied	58	73.0
Program contribution		
A lot	46	58.0

Table 4.3 (*continued*)

Comments	Number	Percent
Somewhat satisfied	33	42.0
Improvement to health		
Very little satisfied	6	7.0
Somewhat satisfied	36	43.0
Considerably	30	35.0
A lot	13	15.0
Refresher courses		
Yes, monthly	18	23.0
Yes, every 6 months	21	27.0
Yes, once a year	32	42.0
Never	6	8.0

lot or *considerably* and an additional 42% said *somewhat satisfied*. Only 7% of the participants indicated that the program improved their health *very little satisfied* (see Table 4.3).

Refresher Courses

Eighty-three percent of the participants would like to return for a refresher course over various time periods: (a) monthly (21%), (b) every 6 months (25%), and (c) yearly (37%; see Table 4.3).

Program Recommendations

Ninety-eight percent of the participants would recommend the program (77% *yes, definitely* and 21% *yes*), and 3% would *maybe* recommend the program.

Recommendations for Program Improvement

Participants in the Build-A-Bone Program provided narrative recommendations for program improvement. The responses were provided in answer to the following open-ended question: What are your recommendations for Build-A-Bone Program improvement? Sixty-three participants entered free-text responses, with 17% of those respondents mentioning lack of follow-through and motivation to maintain behavior change and 22% suggesting learning reinforcement with provision of a follow-up program (refresher courses). Participants (4%) also commented that the digital video disc incentive, which was provided for participation in this study, acted as a reminder and reinforcement to resume previously learned osteoporosis prevention behaviors.

Additional comments included requests for extra weight-lifting/exercise courses incorporated into the program, weekly exercise classes after the program, additional locations for the program, and increased advertising in order to reach at-risk populations—including young women and men. The suggestions were consistent with other studies investigating process evaluations and osteoporosis prevention (Curry et al., 2002; Gold & Silverman, 2004; Turner et al., 2004).

Correlations

In order to determine the reasons for client satisfaction, a number of correlations were performed using Pearson *r*. Satisfaction measures were highly intercorrelated (see Table 4.4). All correlations are significant at the .01 level. Satisfaction with the program was not correlated with the number of sessions attended or with how well the participants knew the program staff prior to attending the Build-A-Bone Program.

Table 4.4

Correlations of Overall Satisfaction With the Build-A-Bone Program

Variable	Correlation with satisfaction
Would like to come back for a refresher	.28
Would recommend the program	.62
Was helped by the program	.40
Satisfaction with program leader	.60
Health improvement	.37

Correlations between satisfaction and demographic measures were also examined. Overall satisfaction with the program was not correlated with age, number of risk factors, or number of falls. Age was significantly correlated with the rating of the program leader ($r = .25$, $p < .05$). The number of reported falls at pretest was significantly correlated with the participants' desire to come back for a refresher class ($r = .24$, $p < .05$) as well as with how much the participants believed the program improved their health ($r = .24$, $p < .05$). Finally, the number of pretest risk factors was significantly correlated with whether the participants would recommend the program to others ($r = .24$, $p < .05$).

Study Limitations

The limitations of the research methods and design utilized in this study are listed below. Many of these study limitations could not be removed given that the research was conducted within the time constraints and the use of a retrospective rather than a prospective study. The experimental design limitations to the outcome results are listed in Chapter 1 and Chapter 5. Study limitations related to process evaluation are listed below.

Fidelity checklists provide the program leader and staff with the ability to document program activities and achieve program goals and to compare the program as implemented with the original plans. A limitation with this study is the lack of information related to fidelity checklists that document program monitoring. Although informal monitoring is conducted periodically by the program director, program monitoring data were not available for the process evaluation.

Additional limitations of this study relate to a lack of information from staff in terms of program satisfaction and recommendations for program improvement. These data are important because different staff members have different responsibilities and bring different perceptions to program implementation. These data would have been helpful to compare with participants' process evaluation data and recommendations for program improvement.

Discussion and Conclusions

This investigation of the Build-A-Bone Program presents noteworthy information with regard to process evaluation research and osteoporosis prevention programs. Results from the program process evaluation portion of the study indicate a very high level of satisfaction with the Build-A-Bone Program. The high ratings of the program suggest that the classes are meeting the needs of the participants and that they find the program a good use of their time and a way to improve their health. However, because satisfaction ratings were so high, it was difficult to find any predictors of client satisfaction. A recommendation for future investigation of client satisfaction includes conducting a prospective pretest/posttest for comparison that would examine all participants registered for the program rather than a sample of participants who completed all or most the program.

Recommendations for future evaluation research include conducting and reporting of the process evaluation results of osteoporosis prevention programs. Program goals, objectives, and intended outcomes should be clearly defined through all stages of program implementation. Enrollment, retention, and follow-up strategies

should be investigated during the formative stages of program development in order to assure that the program matches the needs of the participants. Further, it would be helpful if future evaluations of osteoporosis prevention programs included measures of the specific aspects that participants found to be the most useful. Whereas participants received information on exercise, posture, walking, weight lifting, nutrition, and core strength, the usefulness of this information may differ across different types of participants.

Inasmuch as this investigation of effectiveness and impact of a community outreach osteoporosis prevention program presents noteworthy information, certain aspects of osteoporosis and program processes were not addressed in this study (e.g., factors of advertising that impact client satisfaction and reasons for not participating in refresher courses). Currently, there is a lack of evaluation research of osteoporosis prevention programs, and recommendations for further research should include the investigation of these factors. Further research is needed to address the ever-increasing need for osteoporosis prevention.

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CHAPTER 5

SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to advance osteoporosis prevention and to develop new knowledge for effective ways to reduce falls and to improve quality of life of people living with osteoporosis. The Build-A-Bone Osteoporosis Prevention Program (hereafter referred to as Build-A-Bone Program) is a multicomponent educational experiential skills training program designed to teach participants ways to optimize bone health, prevent osteoporosis, and reduce falls and risk of fractures. In the United States, there are few osteoporosis prevention programs comparable to the Build-A-Bone Program. Further, there is a lack of outcome and process evaluation research investigating the effectiveness (i.e., behavior change) and impact (i.e., fall reduction) of currently available programs. This study was designed to investigate the effectiveness and impact of the Build-A-Bone Program at the University of Utah Orthopedic Center in Salt Lake City, Utah.

Outcome evaluation research was conducted to answer the following research questions:

1. Does the client risk level at program entry measured by the osteoporosis risk assessment result in larger positive outcomes as measured by impact on falls, increased physical activity, and improved

nutrition?

2. Does dosage (i.e., attendance) affect measured osteoporosis health outcomes (e.g., reduction in risk factors and falls and improvement in physical activity, balance, nutrition and dietary patterns, and personal health beliefs)?
3. Do program participants who have been out of the program longer have better or worse outcomes than those who completed the program more recently?

Process evaluation research was conducted to investigate the following research questions:

1. What was the average attendance in the program?
2. What are the characteristics of the participants who attended the program?
3. What was the overall level of client satisfaction with the program?
4. What are correlates (e.g., client or program characteristics) of high client satisfaction?
5. What are client recommendations for program improvement?

The study was conducted utilizing retrospective pretest/posttest questionnaires for individuals who had participated in the Build-A-Bone Program from January 2007 to April 2009. The participant base was 160 individuals, with 103 responses and 83 individuals who participated by completing an online/mailed, hard-copy questionnaire.

The research design was a 2 (repeated measures) X 2 (post hoc risk level) analysis of variance. The research questions addressed both the main effects for program outcomes (i.e., time) as well as interactions between time and risk. The research examined the following dependent variables: (a) risk factors, (b) falls, (c) physical activity, (d) balance, (e) nutrition and dietary patterns, and (f) personal health beliefs.

Outcomes were measured using subscale portions of standardized instruments commonly used in health research. The measures were aggregated into a single testing battery and formatted for the "then-and-now" questionnaire.

Data collection took place from June 2009 to August 2009. Analyses of outcome data and process evaluation data were conducted using SPSS, Version 12, for Windows.

Discussion and Conclusions

This investigation of the Build-A-Bone Program presents noteworthy information with regard to main effects for program outcomes (i.e., time) as well as interactions between time and risk. The following dependent variables were investigated: (a) risk factors for osteoporosis, (b) falls, (c) physical activity, (d) balance, (e) nutrition and dietary patterns, and (f) osteoporosis health beliefs.

The conclusions of this program evaluation are positive and suggest that a multicomponent experiential skills training program for osteoporosis prevention can reduce risk factors and, most importantly, reduce the most dangerous problem of osteoporosis, namely, falls. Participants reported that their rate of falls had decreased

by 50% from prior to the program. With regard to physical activity, the participants had significantly increased their physical activity, including moderate exercises, vigorous exercises, and weight training. Walking, however, was unchanged, which could be the result of a ceiling effect in that the participants were walking 4.5 days before participating in the program. The participants' composite modifiable risk factors also decreased significantly with an average of one less risk factor at posttest/pretest. Significant main effects for both time and risk factors were found in nutrition and dietary patterns with improvement in both high- and low-risk groups. Significant main effects for time were found for all four subscales of the Osteoporosis Health Belief Scale.

Secondary analyses were conducted for dosage effects, client satisfaction, and time since program completion. Analysis of dosage effects indicated that dosage was not related to any examined posttest outcomes possibly because of the small variability in dosage, with 87% of the participants attending all four sessions. The secondary analysis of client satisfaction effects indicated that satisfaction was not related to any of the outcome variables. The null results may be because client satisfaction was high with little variability. The secondary analysis of time since program completion indicated no significant main effects or interactions. This finding suggests that the participants were maintaining behaviors over time.

Process evaluation results indicated high client satisfaction with the program and staff and participants would recommend the program to others. Investigations with regard to client satisfaction showed significant correlations with

recommendations for the program and staff, requests for refresher courses, and comments of the program's contribution to health. Additional results of this study suggest that a large percentage of prior participants (82%) in the program would be willing to complete an online or mailed survey to evaluate the program. In this case, the incentive of the digital video disc and weight vest matched well the recommendation for improvement, namely, a way to reinforce or refresh their osteoporosis prevention knowledge and behaviors learned through the Build-A-Bone Program at home. No negative results were reported for the program.

The use of the retrospective pretest/posttest methodology has implications for osteoporosis prevention research. Advantages include one-time testing and a reduction in data management. Further, the retrospective methodology removes the threat to internal validity of testing (sensitization from pretest to posttest) and instrumentation that addresses the cognitive judgments made in self-report studies that the person has changed. A disadvantage of this testing method includes memory loss of the participants, which may lead to inaccurate results.

Study limitations were observed while conducting this research. The foremost limitation was the lack of a true experimental, randomized, control design. The lack of standardized measurement instruments limits the ability to compare outcomes with other studies of similar interest. Further, generalizability of the results is limited because of the interaction effects of the setting/treatment and history/treatment as well as the highly motivated, nearly homogeneous sample used in this study.

Applications

Implications for Health Promotion and Education

This study has provided useful information to advance health promotion and health education in terms of osteoporosis prevention. The findings related to participant referral to the program indicated that 6% of the participants reported a physician referral/recommendation for attendance in the program. This finding suggests that the medical community may not be aware of the Build-A-Bone program or may not be providing adequate information to promote the program to the patients.

Whereas physicians may often be treatment oriented rather than prevention oriented, the need arises for a health educator to be employed in health clinics/medical offices to discuss disease prevention and to make recommendations to attend prevention programs such as the Build-A-Bone program.

Recommendations for Program Improvements

The Build-A-Bone Program is innovative and unique, providing education and experiential skills training to participants. Positive significant results relate to the effectiveness in behavior change over time, with physical activity and nutrition and dietary patterns and impact related to significant reduction in falls. Further, client satisfaction is high, indicating that the participants found the program to be a beneficial way to learn about osteoporosis prevention and skills to reduce falls. The results can be used to attract additional funding for the program and dissemination of the results to other programs and clinics.

Based on this investigation, recommendations for program improvements include provision of refresher courses and reinforcement materials for the participants to take home and sustain behavior change over time. This would reinforce learned behaviors of physical activity, nutrition and dietary patterns, and reduction in falls. Reinforcement could include homework assignments to establish a behavioral routine, digital video discs, and scheduled refresher courses with the Build-A-Bone Program. Increased advertising is recommended to target additional populations in need of osteoporosis prevention, including men, young women, and individuals of various ethnicities.

Recommendations for Improving Research

Recommendations for improving future osteoporosis research include a prospective pretest/posttest research design to validate the retrospective pretest/posttest used in this study. Further, development of standardized testing instruments used in osteoporosis prevention would provide the ability to increase reliability of the measures commonly used in health research. Documented program monitoring, including staff recruitment and training with fidelity checklists, would be helpful for future program evaluations of the Build-A-Bone Program. Program goals, objectives, and intended outcomes should be clearly defined through all stages of program implementation. Enrollment, retention, and follow-up strategies should be investigated in order to assure that the program matches the needs of the participants. Finally, it would be beneficial to explore specific aspects of the Build-A-Bone Program participants found to be most useful.

Recommendations for Future Research

Inasmuch as this investigation of effectiveness and impact of a community outreach osteoporosis prevention program presents noteworthy information, certain aspects of osteoporosis were not addressed in this study. Examples include the contribution of medication on increased bone density and fracture reduction, diagnosis and treatment of osteoporosis, and assessment of the psychological impact and quality of life associated with the disease. Additional research is recommended to investigate ways for improved recruitment of underserved populations to osteoporosis prevention programs, including men, younger women, and individuals of various ethnicities. Research investigating theoretical application to prevention programs is suggested to find additional ways to enhance positive behavior change. Further, exploration of the impact of osteoporosis prevention programs on increasing bone density based on actual laboratory data is encouraged. Currently, there is a lack of evaluation research of osteoporosis prevention programs. Recommendations for further research would include the investigation of these factors.

Prevention, early recognition (particularly in perimenopausal years), and appropriate treatment can significantly decrease morbidity, mortality, and health-care costs related to osteoporosis. Whereas lifestyle modifications are necessary to diminish modifiable risk factors, reduce the progression of osteoporosis, and prevent future osteoporotic-related fractures, there is a significant need to promote education, healthy behaviors, lifestyle modifications, and further research associated with osteoporosis prevention.

APPENDIX A

INTRODUCTION LETTER

Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program

Dear _____:

I would like to introduce myself. My name is Robyn Hyatt and I am a doctoral student at the University of Utah. I am conducting a program evaluation on the "Build-A-Bone" Osteoporosis Prevention Program at the University of Utah Orthopaedic Center as partial fulfillment for my PhD degree.

The purpose of this research is to investigate the effectiveness and impact of the "Build-A-Bone" Osteoporosis Prevention Program. We are conducting this study because there is very little evidence based research regarding community outreach osteoporosis prevention programs and the results of this study will develop new knowledge on effective ways to reduce falls and improve the quality of life of people living with osteoporosis.

This study is supported by Dr. Patty Trela, director of the "Build-A-Bone" program.

Hi,

I hope you are well and continuing to take care of your bones. I am excited to have a graduate student interested in looking at outcomes of the "Build a Bone" Program. She would like to collect information through a survey about what our past graduates have continued to do, aren't doing anymore, and your satisfaction with the program plus recommendations for improvement. Your input is critical and I hope you can help us with this research project. I have completed an exercise DVD of all exercises taught in the class and we will send one to you for free for just completing the survey. Thank you for your time.

Sincerely,

Patty Trela, PT, DPT, CMPT

The process for this study is as follows:

1. We will be contacting you by phone during June 1-12, 2009.

2. We will ask you if you would be interested in participating in the study. The study involves completing a questionnaire regarding your experiences with the "Build-A-Bone" program. The questionnaire is approximately 160 questions and takes 20-25 minutes to complete. During the phone call, we will also ask you simple questions about your mental capacities to participate in the study. We will be asking these questions of everyone in the study and not anyone in particular. Also during this phone call, we will confirm an e-mail address so that we can send you the information regarding the online survey and the link to access the questionnaire. If you do not have an e-mail address or access to a computer, we will ask for your home address and we will send the questionnaire to you and provide return postage.

3. You will have 2 weeks to complete the questionnaire after you receive it either through e-mail or by U.S. mail: June 15-29, 2009. We will follow-up with a reminder e-mail or phone call if needed.

4. As an incentive to participate in this study, we will send you a DVD ($39.00 value) after data collection is complete. This DVD was produced by Dr. Patty Trela, director of "Build-A-Bone" Program and reviews topics covered in the program such as bone health, exercise, or nutrition. Also, you will be eligible to be entered into a drawing to win a "Wasatch Weight Vest" valued at $125.00.

Your participation in this study is voluntary. You can choose not to take part and you can also choose not to finish the questionnaire or omit any question you prefer not to answer without penalty or loss of benefits such as current or future "Build-A-Bone" program participation.

All records and data pertaining to you will be kept confidential. Individual records will have unique ID numbers which will be generated by "SurveyMonkey.com" Also, all information will be kept in locked cabinets and/or password protected computer files. Only those individuals directly conducting this study will be allowed to view collected data.

If you have any questions, concerns, or complaints, please contact Robyn Hyatt, RDH, MS (principal investigator) 801-998-8462, or Dr. Karol Kumpfer, Professor, Department of Health Promotion and Education, University of Utah (801-581-7718).

Please contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions,

complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu

Thank you so much for your willingness to participate in this study,

Sincerely,

Robyn Hyatt, RDH, MS

APPENDIX B

TELEPHONE SCRIPT FOR RECRUITERS

ID: _____

Date: _____
Name: _____
Date of birth: _____
Recruiter: _____

Hello Mr/Mrs/Ms: _____

My name is _____ and I am calling from "Build-A-Bone" Program at the University of Utah Orthopaedic Center. I am working on a study with the purpose of determining the effectiveness of the "Build-A-Bone" Osteoporosis Prevention Program on participant's outcomes. We recently sent you a letter asking you to consider participating in our study. I am calling to explain our study to you. It will take about 5 or 10 minutes. Is this a good time for me to talk to you or is a later time better?

Yes _____ (proceed)

No _____ (When could I call you back that would be a better time for you?)

Day and time to call: _____

Great! Let me briefly explain our study. What we are doing is asking individuals who have taken classes with the "Build-A-Bone" Program in the past to answer some questions in a questionnaire. We know that it may have been some time since you completed the "Build-A-Bone" program. That doesn't matter. We are doing this study because there is very little research regarding community outreach osteoporosis prevention programs and the results of this study will develop new knowledge on effective ways to reduce falls and improve the quality of life of people living with osteoporosis.

The questionnaire that we are asking you to complete is approximately 160 questions and will take approximately 20-25 minutes to complete. The questionnaire will be posted online and you will be able to access the survey with a link that will be provided. You will have 2 weeks to complete the online survey. If you do not have access to a computer we can send you a questionnaire through the U.S. mail and you will just need to return it to us in the return postage paid envelope.

All records and data pertaining to you will be kept confidential. Individual records will have unique ID numbers which will be generated by "SurveyMonkey.com." Also, all information will be kept in locked cabinets and/or password protected computer files. Only those individuals directly conducting this study will be allowed to view collected data. All data are Secure Sockets Layer protected which means special keys will be used to encrypt the data for security.

As an incentive to participate in this study, we will send you a DVD valued at $39.00 after you complete the questionnaire. This DVD was produced by Dr. Patty Trela, director of "Build-A-Bone" Program, and covers topics covered in the program such as bone health, exercise, or nutrition. Also, you will be eligible to be entered into a drawing to win a "Wasatch Weight Vest" valued at $125.00. Does this sound like something you would like to help us with?

Wonderful! We really appreciate your willingness to work with us and help us with this study.

I just need to make sure we have your birthday correct.

1a. How old are you? Age: _____

1b. When is your birthday? _____

2. Now, I have a few questions that we are asking everyone interested in helping us with this study. Your answers to these questions will let us know if being in this study will be too tiring for you or if any medications you are taking will prevent you from answering the questions. Can I go ahead and ask you these questions?

Yes: _____ (proceed)
No: _____ That is fine. Unfortunately, you are ineligible to participate in our study. Thank you for talking to me today. Have a nice day, good-bye.

Mini-Mental—Short Form

(For evening callers, be aware of the sundown syndrome in our older individuals. They may get confused in the evening, but are OK in the daytime. If you think this is the case, have a daytime caller verify the mini-mental before rejecting the individual. The data are collected in the daytime so should be OK.)

Instructions: There should be no blanks. Scoring is from 0-18. Cut off is 14 (13 or lower is indicative of impairment). Do not continue with subjects who score 13 or lower. Exit as gracefully as possible. You may want to say something like, "according to the questions that I have asked you, I think that being in this research study will be too exhausting or tiring or not good for you right now. We appreciate your interest. If there is any way we can be of help to you in the future, please give us a call."

Maximum:

Score	Score	Orientation
5	( )	What is the (year) (season) (date) (day) (month)?
5	( )	Where are you? (state) (country) (town) (street) (house address)?

Orientation: +/- 2 days within date is okay. The month/year/season/ street/house address must be correct. Score 1 point for each correct answer. Total score range is 5 points for each of the two orientation questions.

		Registration
3	( )	Name 3 objects: <u>apple, penny, airplane</u> 1 second to say each. Then ask subject to name all 3 after you have said them. Give 1 point for each correct answer.

Registration: Data collector names three objects/items. Have client repeat. Select objects from environment or things subject is most likely to be familiar with, non-related items.

		Attention and calculation
5	( )	Spell "world" backwards.

Attention and calculation: Score 1 point for each letter in correct sequence.

<u>Alternative question for attention and calculation:</u> For subjects not able to spell "world" backward. Have them look at a clock or watch that is easily visible. Ask what time is it now? What time will it be in 5 minutes? Score 1 point for each minute correct. For example, if the time is 3:15, the time in 5 minutes should be 3:20. If the subject correctly says 3:20, then he would get 5 points. If the subject says the time in 5 minutes from 3:15 would be 3:22, then he is 2 minutes off from the correct answer and would get 3 points. If he says 3:19, his score would be 4 points because his answer is 1 minute off from the correct answer.

<u>IF PARTICIPANT INELIGIBLE: From the information you've given me, it appears that *you do not meet the criteria for our study*, but I want to thank you for your time talking with me today!</u>

<u>If PARTICIPANT ELIGIBLE [only reason she would not be is if she fails the mini-mental exam]: Thanks so much! It seems you are certainly still eligible to work with us. Can I mark you down as agreeing to fill out our questionnaire? We appreciate your help. Now I just have a few more questions. Do you have computer access?</u>

Yes _____ Great! May we have your e-mail address so we can send you the link to the questionnaire? E-MAIL

ADDRESS: _____

Let me tell you what will happen next. You will receive an e-mail on or about June 15, 2009. Click on the link provided in the e-mail and you will be directed to the survey which is posted on SurveyMonkey.com. You will have 2 weeks to complete the questionnaire. Simply complete the questionnaire, and print two copies of the receipt. One copy of the receipt will be for your records. Mail the other copy of the receipt to the address provided and we will mail you the DVD just for completing the survey. We will then enter your receipt into a drawing for the "Wasatch Weight Vest." If you are the winner, we will contact you and send you the "Wasatch Weight Vest."

No _____ Ok. . . . May I send a questionnaire to your home so that you can complete it and send it back to us? We will provide return postage.

Let me tell you what will happen next. We will mail a questionnaire to your address on or about June 15, 2009. You will have 2 weeks to complete the questionnaire. Simply complete the questionnaire, and print two copies of the receipt. One copy of the receipt will be for your records. Mail the questionnaire and the second copy of the receipt to the address provided and we will mail you the DVD just for completing the questionnaire. We will then enter your receipt into a drawing for the "Wasatch Weight Vest." If you are the winner, we will contact you and send you the "Wasatch Weight Vest."

Do you have any questions?

You may contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu.

Thank you so much for talking with me today! If you have any questions or concerns, please contact Robyn Hyatt at 801-998-8462 or Dr. Karol Kumpfer (Department of Health Promotion and Education) at 801-581-7718.

Do you have any further questions?

Thank you again!

APPENDIX C

BUILD-A-BONE OSTEOPOROSIS PREVENTION PROGRAM

"THEN/NOW" QUESTIONNAIRE

"Build-A-Bone" Osteoporosis Prevention Program

"Then/Now" Questionnaire

Instructions to Participants:

You have completed the "Build-A-Bone" Program to help improve your bone health. You have now learned how to optimize your bone health and prevent osteoporosis. The questionnaire has been designed to assess the impact and effectiveness of the "Build-A-Bone" Program. This is not a test. The information from this questionnaire will be used to see what people have learned and how people have changed and to recommend ways to improve the program in the future.

Please mark the best answer to the best of your ability. You are not expected to know the answers to all the questions. If you do not know the answer or are unsure about it, please mark "don't know."

All records and data pertaining to you will be kept confidential. Individual records will have unique ID numbers which will be generated by "SurveyMonkey.com" All information will be kept in locked cabinets and/or password protected computer files. Only those individuals directly conducting this study will be allowed to access your information. All data are SSL protected which means special electronic keys will be used to encrypt the data for security. Results of the study may be published; however, your name and other identifying information will be kept private.

Now, let's begin:

QUESTIONS ABOUT YOU

1. Participant Number_____

2. Today's Date |___|___| / |___|___| / |___|___|
Month Day Year

3. In which month and year did you attend the "Build-A-Bone" Program"?

Month_____ Year_____

4. Was this your first time participating in "Build-A-Bone"? **1**= Yes **2**= No

5. If No, how many times have you previously attended the "Build-A-Bone" Program?
_____

6. _____What is your gender? **1** = Male **2** = Female

7. _____What is your ethnicity? (if mixed, list all that apply)

1 = African American/Black **5** = Alaska Native
2 = Asian **6** = White
3 = American Indian **7** = Hispanic or Latino
4 = Pacific Islander **8** = Other (Specify) _____

8. _____What is the language you use most often at home?

1= English **2** = Spanish **3** =Other Language: Specify_____

9. _____ How old are you? (Years)

10. _____ Have you been diagnosed with osteoporosis?
1 =Yes **2** = No

11. _____ Have you been diagnosed with osteopenia?
1=Yes **2**=No

12. _____ Which situation best describes the reasons why you enrolled in the "Build-A-Bone" Program?

1 = to improve my health
2 = to prevent osteoporosis
3 = to reduce falls
4 = doctor's recommendation
5 = Other _____

13. _____ Did you have a DEXA scan **BEFORE** attending the "Build-A-Bone" Program?
1=Yes **2**=No

14. _____ If yes, what was your t-score? _____

15. _____ Have you had a DEXA scan **AFTER** attending the "Build-A-Bone" Program?
1=Yes **2**=No

16. _____ If yes, what was your most recent t-score? _____

17. _____ Did you take hormonal replacements **BEFORE** attending the "Build-A-Bone" Program?
1= Yes **2**= No

18. _____ Do you currently take hormonal replacements **AFTER** attending the "Build-A-Bone" Program?
1= Yes **2**= No

19. _____ Have you participated in any other osteoporosis prevention programs since attending the "Build-A-Bone" Program?
1= Yes **2**= No

20. _____ What is your highest level of education?

1. High School/GED
2. AAS/AS Degree
3. Bachelors degree
4. Masters degree
5. PhD/MD/DDS

Now we will ask you questions regarding your RISK FACTORS for osteoporosis.

The following is a list of **risk factors** for osteoporosis. Please mark an "X" in the column by all the risk factors that applied to you **BEFORE** taking the "Build-A-Bone" Program:

X X X

	Low bone mass		**Thin body build**		**Low calcium intake (less than 1,000 mg daily)**
	Vitamin D deficiency (less than 400 IU daily)		**High sodium diet**		**Estrogen deficiency (women)** **Low testosterone (men)**
	Alcohol (3 or more units per day)		**Anorexia nervosa**		**Use of certain medications (glucocorticoids, corticosteroids/chemotherapy, anticonvulsants)**
	Sedentary lifestyle		**Cigarette smoking**		**Excessive caffeine intake (more than 300mg daily)** **8 oz coffee = 80-150mg** **8oz tea = 50mg** **8 oz energy drink = 80mg** **12 oz cola = 45mg**

NOW, please mark an "X" in the column by all the risk factors that apply to you **CURRENTLY** or "**AFTER**" taking the "Build-A-Bone" Program:

X X X

	Low bone mass		**Thin body build**		**Low calcium intake (less than 1,000 mg daily)**
	Vitamin D deficiency (less than 400 IU daily)		**High sodium diet**		**Estrogen deficiency (women)** **Low testosterone (men)**
	Alcohol (3 or more units per day)		**Anorexia nervosa**		**Use of certain medications (glucocorticoids, corticosteroids/chemotherapy, anticonvulsants)**
	Sedentary lifestyle		**Cigarette smoking**		**Excessive caffeine intake (more than 300mg daily)**

FALLS (EFST modified)

Now we will ask you a few questions about any falls you may have experienced **BEFORE** and **AFTER** taking the "Build-A-Bone" Program. A fall would be described as when you find yourself suddenly and unexpectedly on the ground after your were in either a sitting, lying or standing position. (EFST modified)

19. _____ Did you experience a fall **BEFORE** the "Build-A-Bone" Program?
1= Yes **2**= No

20. _____ If Yes, How many falls?
1 = 1 **2** = 2 **3** = 3 **4** = 4 **5** = 5 or more

21. _____ Did you injure yourself from any fall?
1- Yes (soft tissue/fracture) **2**= No

22. _____ Have you experienced a fall **AFTER** completing the "Build-A-Bone" Program?
1 = Yes **2** = No

23. _____ If Yes, How many falls?
1 = 1 **2** = 2 **3** = 3 **4** = 4 **5** = 5 or more

24. _____ Did you injure yourself from any fall?

1- Yes (soft tissue/fracture) **2**= No

Physical Activity BEFORE the "BUILD-A-BONE" Program (IPAQ)

Please answer the following nine questions about the time you spent being physically active **BEFORE** taking the "Build-A-Bone" Program. Please attempt to answer each question to the best of your ability even if you do not consider yourself to be an active person. Please think about the activities you did at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you experienced each week. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities are those activities that take **moderate** physical effort and make you breathe a bit harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time. Please attempt to answer each question to the best of your ability even if you do not consider yourself to be an active person

1. During a given week, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?
_____ **days per week**

☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?
_____ **hours per day**
_____ **minutes per day**

☐ Don't know/Not sure

Think about all the **moderate** activities that you did in a given week. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During **a given week**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.
   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?
   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about the time you spent **walking during a given week**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During **a given week**, on how many days did you **walk** for at least 10 minutes at a time?
   _____ **days per week**

   ☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

The next question is about the time you spent **sitting** on weekdays during a given week. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During a given week, how much time did you spend **sitting** on a **week day**?

   _____ **hours per day**
   _____ **minutes per day**

☐ Don't know/Not sure

The next questions are about the time you spent lifting weights during a given week.

8. During **a given week**, on how many days did you do weight lifting exercises?

   _____ **days per week**

   ☐ No weight lifting

9. How much time did you usually spend doing weight lifting exercises on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Physical Activity AFTER the "BUILD-A-BONE" Program (IPAQ)

Please answer the following nine questions about the time you **CURRENTLY** spend being physically active. Please attempt to answer each question to the best of your ability even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you experience each week. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you do for at least 10 minutes at a time. Please attempt to answer each question to the best of your ability even if you do not consider yourself to be an active person

1. During the **last 7 days**, on how many days do you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

☐ Don't know/Not sure

Think about all the **moderate** activities that you do in a given week. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days do you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.
   _____ **days per week**

   ☐ No moderate physical activities → ***Skip to question 5***

4. How much time do you usually spend doing **moderate** physical activities on one of those days?
   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about the time you spend **walking** during the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days do you **walk** for at least 10 minutes at a time?
   _____ **days per week**

   ☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

   _____ **hours per day**
   _____ **minutes per day**

   ☐ Don't know/Not sure

The next question is about the time you spend **sitting** on weekdays during a given week. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time do you spend **sitting** on a **week day**?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

The next questions are about the time you **CURRENTLY** spend lifting weights during the last 7 days.

8. During the **last 7 days**, on how many days do you do weight lifting exercises?

   ____ **days per week**

   ☐ No weight lifting →

9. How much time do you usually spend doing weight lifting exercises on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

BALANCE: Berg Balance Scale (modified)

The following questions are about your balance **BEFORE** and **AFTER** taking the "Build-A-Bone" Program. Please rate your **ABILITY** to balance in the following activities according to the following scale:

0 = NO ABILITY 1 = LOW ABILITY 2 = MODERATE ABILITY 3 = HIGH ABILITY 4 = NO LIMITATION

BEFORE	ACTIVITY	AFTER
	1. Sitting unsupported	
	2. Change of position: sitting to standing	
	3. Change of position: standing to sitting	
	4. Standing unsupported	
	5. Standing with eyes closed	
	6. Standing with feet together	

	7. Standing with one foot behind the other	
	8. Standing on one leg	
	9. Turning to look behind	
	10. Retrieving objects from floor	
	11. Turning completely around	
	12. Stool stepping	
	13. Reaching forward while standing	

NUTRITION AND DIETARY PATTERNS

The following questions are related to your nutrition and dietary habits. Please try to remember your dietary habits in the few weeks **BEFORE** taking the "Build-A-Bone" Program. In the column marked **AFTER**, please state your **CURRENT** dietary habits.

BEFORE 1=Yes 2=No	**Nutrition and Dietary Patterns**	**AFTER** 1= Yes 2= NO
	1. I consume recommended daily doses of calcium (1,000-1200mg)	
	2. I consume recommended daily doses of Vitamin D (400-800 IU)	
	3. I get 15-30 minutes of sunlight 2-3 times each week	
	4. I eat a diet low in sodium	
	5. I take calcium supplements daily	
	6. I take Vitamin D supplements daily	
	7. I eat a diet high in wheat bran	
	8. I eat a diet high in animal protein	
	9. I spread my daily calcium intake throughout the day	

	10. I consume excessive caffeine daily (more than 200-300mg)	
	11. I eat a diet high in dairy products	
	12. I consume less than 3 units of alcohol per day	

PERSONAL HEALTH BELIEFS Osteoporosis Health Belief Scale (modified)

The following questions are regarding your beliefs about osteoporosis. There are no right or wrong answers. The first set of questions is about your beliefs about osteoporosis **BEFORE** taking the "Build-A-Bone" Program. The second questions regard your beliefs about osteoporosis **AFTER** taking the "Build-A-Bone" Program.

Personal health beliefs BEFORE attending "Build-A-Bone" Program

Health Belief	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
1. Because of your body build, you are more likely to develop osteoporosis.					
2. You are more likely than the average person to get osteoporosis.					
3. Your feelings about yourself would change if you got osteoporosis.					
4. It would be very serious if you got osteoporosis.					
5. Regular exercise prevents problems that would happen from osteoporosis.					
6. Regular exercise helps to build strong bones.					
7. Regular exercise cuts down the chances of broken bones.					
8. Taking enough calcium prevents problems from osteoporosis.					
9. Taking enough calcium cuts down on your chances of broken bones.					
10. Exercising regularly would mean starting a new habit which is hard for you to do.					
11. Exercising regularly makes you uncomfortable.					

12. Eating calcium-rich foods means changing your diet which is hard to do.					
13. In order to eat more calcium-rich foods, you have to give up other foods that you like.					
14. Keeping healthy is very important for you.					
15. You follow recommendations to keep yourself healthy					

Personal health beliefs AFTER attending "Build-A-Bone" Program

Health Beliefs	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
16. Because of your body build, you are more likely to develop osteoporosis.					
17. You are more likely than the average person to get osteoporosis.					
18. Your feelings about yourself would change if you got osteoporosis.					
19. It would be very serious if you got osteoporosis.					
20. Regular exercise prevents problems that would happen from osteoporosis.					
21. Regular exercise helps to build strong bones.					
22. Regular exercise cuts down the chances of broken bones.					
23. Taking enough calcium prevents problems from osteoporosis.					
24. Taking enough calcium cuts down on your chances of broken bones.					
25. Exercising regularly would mean starting a new habit which is hard for you to do.					
26. Exercising regularly makes you uncomfortable.					
27. Eating calcium-rich foods means changing your diet which is hard to do.					
28. In order to eat more calcium-rich foods, you have to give up other foods that you like.					
29. Keeping healthy is very important for you.					
30. You follow recommendations to keep yourself healthy					

CLIENT SATISFACTION

Now we will ask you questions regarding how you feel about the "Build-A-Bone" Program. There are no right or wrong answers.

1._____ Who told you about this "Build-A-Bone" Program?
1 = friend , **2** = program staff, **3** = doctors, **4** = physical therapists,
5 = family, **6** = flyer or poster, **7** = other (specify): _____

2. _____ How well did you know any of the program staff prior to signing up for this program?
1= Not at all **2** Very little **3**= Somewhat **4** = Well **5**= Very Well

3. _____ How many (2) hour sessions of the 4 week series did you attend of the "Build-A-Bone" program? (1, 2, 3, or 4)

4._____How satisfied were you with the "Build-A-Bone" program?
1 = Not at all **2** = Very little **3** = Somewhat **4** = Well **5** = Very Well

5. _____ Would you like to come back for refresher classes?
1= Yes, monthly **2** = every six months **3** = once a year **4** = Never

6. _____ Would you recommend this "Build-A-Bone" course to other people?
1 = Yes, definitely **2** = Yes **3** = Maybe **4** = No

7. _____ How much has the "Build-A-Bone" Program helped you?
1 = Not at all **2** = Very little **3** = Somewhat **4** = A lot

8. _____ Overall, how would you rate your *satisfaction* with the program group leader?

1 = Not at all **2** = Very little **3** = Somewhat **4** = Well **5** = Very Well

9. _____ How much do you think this class has improved your overall health?
1 = Not at all **2** = Very little **3** = Somewhat **4** = Considerably **5** = A lot

10.What are your recommendations for "Build-A-Bone" program improvement?_____
_____
_____
_____
_____
_____

_____
_____
_____
_____
_____

You have now completed the questionnaire.

Thank you so much for your willingness to participate.

RECEIPT

(Mail this with your questionnaire)

"Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program"

This completes your participation in this study. Please complete this receipt with your address and attach it to your questionnaire. (You will keep one copy for your records.)

Please return to:

Robyn Hyatt, RDH, MS
4823 Brooks Way
Salt Lake City, Utah 84117

Please circle your preference for the DVD:

*****Bone Health** *****Exercise** *****Nutrition**

Your address:

_____
_____
_____
_____

Thank you again for your participation in this study.
Best regards,
Robyn Hyatt, RDH, MS

RECEIPT
(Copy for your records)

"Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program"

This completes your participation in this study. Please complete this receipt and keep this copy for your records.

Robyn Hyatt, RDH, MS
4823 Brooks Way
Salt Lake City, Utah 84117

Please circle your preference for the DVD:

*******Bone Health** *******Exercise** *******Nutrition**

Your address:

_____
_____
_____

Thank you again for your participation in this study.
Best regards,
Robyn Hyatt, RDH, MS

APPENDIX D

E-MAIL TO PARTICIPANTS WITH LINK

Dear _____:

Thank you for your willingness to participate in the "Build-A-Bone" Osteoporosis Prevention Program study.

Please click on the link to access the questionnaire.

http://www.surveymonkey.com/s.aspx?sm=W_2bQyYiGbzdqbQ0CxVEGB1g_3d_3d

Best regards,

Robyn Hyatt

APPENDIX E

MAILED QUESTIONNAIRE COVER LETTER

Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program

You are being asked to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and decide whether or not to volunteer to take part in this research study.

The purpose of this research study is to investigate the effectiveness and impact of the "Build-A-Bone" Osteoporosis Prevention Program. We are doing this study because there is very little evidence-based research regarding community outreach osteoporosis prevention programs and the results of this study will develop new knowledge on effective ways to reduce falls and improve the quality of life of people living with osteoporosis.

You will be asked to complete the enclosed questionnaire regarding your participation in the "Build-A-Bone" Osteoporosis Prevention Program. We will ask questions about you BEFORE taking the "Build-A-Bone" program and questions about you AFTER taking the "Build-A-Bone" program. Some of the questions may be sensitive in nature regarding your health and health-related behaviors. If you do not want to complete a question, you may skip the question. Please return the questionnaire in the enclosed self-addressed stamped envelope. Please return the questionnaire by Monday, June 29, 2009.

An incentive is offered to the participants of this study. This will include a free DVD ($39.00 value) created by Dr. Patty Trela and that reviews topics covered in the "Build-A-Bone" program such as bone health, exercise, or nutrition. After completing the questionnaire, please print two copies of the receipt. One copy is for your records and the other copy you will attach to the questionnaire and mail to Robyn Hyatt to receive your DVD. Please remember to mark your preference for the DVD at the end of the questionnaire and we will send it to the address you provided to us when we first contacted you. We will also enter your receipt into a drawing for a free "Wasatch Weight Vest" ($125 value) to be given at the close of the data collection.

All records and data pertaining to you will be kept confidential. All information will be kept in locked cabinets and/or password protected computer files. Only those individuals directly conducting this study will be allowed to view collected data. All data are Secure Sockets Layer protected, which means special keys will be used to encrypt the data for security.

If you have any questions, concerns, or complaints or if you feel you have been harmed by this research please contact Robyn Hyatt, (principal investigator) 801-998-8462, or Dr. Karol Kumpfer, Department of Health Promotion and Education, University of Utah (801-581-7718).

You may also contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu.

It should take approximately 20-25 minutes to complete the questionnaire. Participation in this study is voluntary. You can choose not to take part and you can also choose not to finish the questionnaire or omit any question you prefer not to answer without penalty or loss of benefits.

By returning this questionnaire, you are giving your consent to participate.

Thank you so much for your willingness to participate in this study.

APPENDIX F

ONLINE QUESTIONNAIRE COVER LETTER

Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program

You are being asked to take part in a research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and decide whether or not to volunteer to take part in this research study.

The purpose of this research study is to investigate the effectiveness and impact of the "Build-A-Bone" Osteoporosis Prevention Program. We are doing this study because there is very little evidence-based research regarding community outreach osteoporosis prevention programs and the results of this study will develop new knowledge on effective ways to reduce falls and improve the quality of life of people living with osteoporosis.

You will be asked to complete a questionnaire regarding your participation in the "Build-A-Bone" Osteoporosis Prevention Program. We will ask questions about you BEFORE taking the "Build-A-Bone" program and questions about you AFTER taking the "Build-A-Bone" program. Some of the questions may be sensitive in nature regarding your health and health-related behaviors. If you do not want to complete a question, you may skip the question. This questionnaire is posted on "SurveyMonkey.com". The questionnaire will be posted online for 2 weeks beginning Monday, June 15, 2009, and ending Monday, June 29, 2009.

An incentive is offered to the participants of this study. This will include a free DVD ($39.00 value) created by Dr. Patty Trela and that reviews topics covered in the "Build-A-Bone" program such as bone health, exercise, or nutrition. After completing the questionnaire, please print two copies of the receipt. One copy is for your records and the other copy you will mail to Robyn Hyatt to receive your DVD. Please remember to mark your preference for the DVD at the end of the questionnaire and we will send it to the address you provided to us when we first contacted you. We will also enter your receipt into a drawing for a free "Wasatch Weight Vest" ($125 value) to be given at the close of the data collection.

All records and data pertaining to you will be kept confidential. Individual records will have unique ID numbers which will be generated by "SurveyMonkey.com". Also, all information will be kept in locked cabinets and/or password protected computer files. Only those individuals directly conducting this study will be allowed to view collected data. All data are Secure Sockets Layer protected, which means special keys will be used to encrypt the data for security. If you are using a public computer, we remind you to close your browser after completion of the questionnaire for additional security.

If you have any questions, concerns, or complaints or if you feel you have been harmed by this research, please contact Robyn Hyatt, principal investigator, at (801)998-8462 or Dr. Karol Kumpfer, Department of Health Promotion and Education, University of Utah at (801)581-7718.

You may also contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints, or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu.

It should take approximately 20-25 minutes to complete the questionnaire. Participation in this study is voluntary. You can choose not to take part and you can also choose not to finish the questionnaire or omit any question you prefer not to answer without penalty or loss of benefits.

Clicking below indicates that you have read the description of the study and agree to participate.

☐ I agree to participate in this study.

☐ I choose NOT to participate in this study.

Thank you so much for your willingness to participate in this study.

APPENDIX G

REMINDER E-MAIL AND INTRODUCTION LETTER

Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program

Dear _____:

We recently sent you the following letter either by e-mail or by U.S. mail. We have been unable to contact you by telephone. If you are interested in participating in this study, please contact Robyn Hyatt at (801)998-8462.

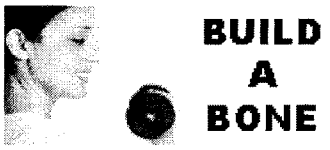
If you are not interested in participating, we will not attempt further contact.

Thank you.

I would like to introduce myself. My name is Robyn Hyatt and I am a doctoral student at the University of Utah. I am conducting a program evaluation on the "Build-A-Bone" Osteoporosis Prevention Program at the University of Utah Orthopaedic Center as partial fulfillment for my PhD degree.

The purpose of this research is to investigate the effectiveness and impact of the "Build-A-Bone" Osteoporosis Prevention Program. We are conducting this study because there is very little evidence based research regarding community outreach osteoporosis prevention programs and the results of this study will develop new knowledge on effective ways to reduce falls and improve the quality of life of people living with osteoporosis.

This study is supported by Dr. Patty Trela, director of the "Build-A-Bone" program.



Hi,

I hope you are well and continuing to take care of your bones. I am excited to have a graduate student interested in looking at outcomes of the "Build a Bone" Program. She would like to collect information through a survey about what our past graduates have continued to do, aren't doing anymore, and your satisfaction with the program plus recommendations for improvement. Your input is critical and I hope you can help us with this research project. I have completed an exercise DVD of all exercises taught in the class and we will send one to you for free for just completing the survey. Thank you for your time."

Sincerely,

Patty Trela, PT, DPT, CMPT

The process for this study is as follows:

1. We will be contacting you by phone during July 15-20, 2009.

2. We will ask you if you would be interested in participating in the study. The study involves completing a questionnaire regarding your experiences with the "Build-A-Bone" program. The questionnaire is approximately 160 questions and takes 20-25 minutes to complete. During the phone call, we will also ask you simple questions about your mental capacities to participate in the study. We will be asking these questions of everyone in the study and not anyone in particular. Also during this phone call, we will confirm an e-mail address so that we can send you the information regarding the online survey and the link to access the questionnaire. If you do not have an e-mail address or access to a computer, we will ask for your home address and we will send the questionnaire to you and provide return postage.

3. You will have 2 weeks to complete the questionnaire after you receive it either through e-mail or by U.S. mail: July 15-31, 2009. We will follow-up with a reminder e-mail or phone call if needed.

4. As an incentive to participate in this study, we will send you a DVD ($39.00 value) after data collection are complete. This DVD was produced by Dr. Patty Trela, director of "Build-A-Bone" Program and reviews topics covered in the program such as bone health, exercise, or nutrition. Also, you will be eligible to be entered into a drawing to win a "Wasatch Weight Vest" valued at $125.00.

Your participation in this study is voluntary. You can choose not to take part and you can also choose not to finish the questionnaire or omit any question you prefer not to answer without penalty or loss of benefits such as current or future Build-A-Bone program participation.

All records and data pertaining to you will be kept confidential. Individual records will have unique ID numbers which will be generated by "SurveyMonkey.com". Also, all information will be kept in locked cabinets and/or password protected computer files. Only those individuals directly conducting this study will be allowed

to view collected data.

If you have any questions, concerns, or complaints, please contact Robyn Hyatt, RDH, MS (principal investigator) 801-998-8462, or Dr. Karol Kumpfer, professor, Department of Health Promotion and Education, University of Utah (801-581-7718).

Please contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu.

Thank you so much for your willingness to participate in this study,

Sincerely,

Robyn Hyatt, RDH, MS

APPENDIX H

RECEIPT

Outcome Evaluation of a Community Outreach Osteoporosis Prevention Program

This completes your participation in this study. Please make 2 copies of this receipt. You will keep one copy for your records. Please mail the second copy of this receipt to:

Robyn Hyatt, RDH, MS
4823 Brooks Way
Salt Lake City, Utah 84117

Please circle your preference for the DVD:

Bone Health Exercise Nutrition

Your address:

_____

_____

_____

Thank you again for your participation in this study.

Best regards,

Robyn Hyatt, RDH, MS